Improving The Export Distribution System For Fresh Fruits And Vegetables

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ABSTRACT

Effectiveness of the distribution system involved in supplying Western Europe with fresh fruits and vegetables produced in the Western United States is examined. All transportation modes are considered, least-cost routings are offered and the potentials for reducing costs and improving service discussed.

Keywords: Transportation, Distribution, Exports, Marketing, Fruits and Vegetables, Containerization.

PREFACE

This study was conducted under a cooperative agreement with the Foreign Agricultural Service, USDA.

Detailed transportation rate and export flow data can be obtained from the authors. Requests should be addressed to:

Transportation Economics
National Economic Analysis Division
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Rate data apply to the 1971-72 shipping season. Flow data were obtained for 1970 and prior years. These data show that exports of fresh fruits and vegetables from the producing area studied are relatively small and rather sporadic. No major changes have occurred in this situation since 1970.

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SUMMARY

Transportation costs for fruits and vegetables shipped from the Western United States to Western Europe are perhaps higher than they need to be, because of inefficiencies in such aspects as scheduling, handling, and information flows. Because of irregular rail service and reduced sailings by ocean vessels, shippers find it hard to schedule shipments to meet sailing dates. Bills of lading, customs declarations, and other documents transmitting needed information often do not arrive at destinations until after the shipments have arrived.

Handling practices both at dockside and on shipboard frequently result in damage to fruit and vegetable cargoes. These practices appear to be the result of a lack of knowledge by the personnel immediately involved rather than any attempt to speed loadings or reduce costs. Such problems appear readily solvable.

Exports of fresh fruits and vegetables to Western Europe are highly seasonal, and shipment size varies markedly among commodities and destinations. Since specialized equipment is required to maintain the market quality of perishables, the distribution system is called upon to maintain excess capacity. It seems likely that the flexibility required of the distribution system results in relatively high rates for transportation services.

Prices for land transportation appear to be increasing. Therefore, reductions could be expected only as the result of efficiencies gained from technology. One recent technological advance, the unit train, was examined and found feasible only for shipments of lettuce from Salinas, Calif., to New York, N. Y. Such operations would make possible rate reductions of $54.66 per car or about 7 cents per carton.

A somewhat different situation was found in ocean transportation. It appears that excess general cargo capacity exists for both container ships and the special port facilities they utilize. By the mid-1970's container ship capacity is expected to exceed demand by one-third to one-half. The formation of a revenue pooling cartel on the North Atlantic indicates that excess capacity has commenced to exert downward pressure on ocean rates. Shipping lines might be favorably disposed to convert many general cargo container positions to refrigerator container positions as a result of the excess general cargo capacity. Such conversions would not prevent the use of a refrigerated position by general cargo containers.

Air freight appears to be used only to transport minimum priced commodities in response to special market conditions. There is no evidence that air freight is trending toward the regular, standardized service characteristic of the more conventional modes. The high speed and operating flexibility available from aircraft appear to assure them of a small but quite important role in exporting fresh produce.

Tariffs of the European Economic Community (EEC) are substantial barriers to increased exports of U.S. fresh fruits and vegetables. The EEC tariff for head lettuce tends to approximate one-half the domestic shipping point-wholesale price spread. The tariff for navel oranges tends to be larger than the domestic shipping point-wholesale price spread. EEC tariffs vary so that the rates tend to be highest in months of U.S. harvest and can be adjusted to countervail any price reduction effected by U.S. shippers.

Least-cost routes from the Western United States to Western Europe were calculated for oranges, lemons, grapefruit, apples, lettuce, and grapes, taking into account each commodity's market life and required storage temperature and atmosphere. Cost differences between these routes and the routes commonly used by shippers were found to be small.

IMPROVING THE EXPORT DISTRIBUTION SYSTEM FOR FRESH FRUITS AND VEGETABLES

By T. Q. Hutchinson, L. A. Hoffman, and R. L. Parlett 1/

INTRODUCTION

The effectiveness of the distribution system involved in supplying Western Europe with fresh fruits and vegetables produced in the Western United States is examined in this study. Primary attention has been focused on those portions of the distribution system which are susceptible to change and improvement.

To the authors' knowledge, this is the first study to apply a total distribution concept to export marketing. Under the total distribution concept all segments of a marketing system are brought under scrutiny. The more traditional practice has been to select segments of a marketing system (transportation, handling, sales, etc.) and examine each independently. Analysis of distribution as a system permits examination of both the system's segments and the interfaces of segments.

As used in this report, the distribution system is the transportation, storage, handling, and information facilities and functions required to move goods satisfactorily from one place to another. Transportation is the physical movement of goods between two locations and handling is the transferring of goods between transportation modes, or between transportation modes and a storage facility.

The goal of a distribution system is to bring goods to a place where they can be sold while customers desire to buy. In addition to this basic function, the distribution system must also deliver goods in salable condition, in the quantities desired, at acceptable costs to the business community at the various stages. From these requirements certain performance measures of a distribution system can be inferred. They are transit time, size of unit transportable, quality assurance for the goods transported, and cost of transportation.

A distribution system must transmit information as well as goods. The shipper must know that goods are desired at a given location, the carrier must know that his services are desired by the shipper, and the receiver must know that the goods have arrived. While the information component of a distribution system may seem so basic as not to merit examination, it is often neglected and poorly performed in the real world.

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Finally, distribution systems are affected by external factors. Public policy limits the behavior of firms and imposes certain charges (taxes) on the system. In the private sector, customs and practices of trade arise and become institutionalized. These external factors may play a larger role in shaping a distribution system than the particular technology and market economics of the period under study.

The investigative approach used in this study has been to (1) define an effective, efficient distribution system, (2) compare the existing system with the ideal system, and (3) outline action that would cause the existing system to more closely approximate the theoretical system.

MEASURES OF A DISTRIBUTION SYSTEM

Transit Time

Any distribution system must be capable of moving goods from one location to another within a given time. The allowable time is a function of the marketable life of the products and of the needs defined by the marketing system within which the product is sold.

Red Delicious apples, the variety most frequently exported from Pacific Northwest growing areas, have a marketable life of 3 to 4 months after harvest. 2/ Fresh grapefruit has a marketable life of 4 to 6 weeks. For fresh lemons the marketable life is 1 to 6 months. Oranges grown in California and Arizona offer a marketable life of 3 to 8 weeks. Head lettuce, as harvested, can be kept as long as 60 days under proper refrigeration and with the outer four wrap leaves left on each head. Trimmed at shipping point (the full trim reduces per head weight by about 25 percent and volume by nearly 50 percent below that of untrimmed lettuce), ready for retail sale, the marketable life is about 3 days. Usual trade practice strikes a medium and results in a marketable life of 2 to 3 weeks. On the average, in U. S. markets, lettuce moves from harvest to consumer in less than 2 weeks.

In practical application the marketable life of a commodity is greatly influenced by the maturity of the commodity at harvest, and by handling and storage practices utilized from harvest onwards. The marketable life shown above reflects the time during which no substantial losses will occur if proper precautions are taken. If a commodity is not marketed within the time shown, part of the shipment will be lost to decay. Moreover, only a portion of the marketable life can be taken up by distribution. Both retailers

2/ The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks, Agr. Handb. 66, rev. Oct. 1968; Protecting Perishable Foods During Transport by Motortruck, Agr. Handb. 105, rev. Nov. 1970; Protection of Rail Shipments of Fruits and Vegetables, Agr. Handb. 195, rev. July 1969; and consultations with specialists in perishable commodities.

and buyers wish to store the commodity, at least for a short time, and typically under less than ideal conditions. The transportation system must, therefore, make delivery before the marketable life is exhausted.

Quality Assurance

Few fresh produce items are compatible with other items in storage. Temperature, humidity, and atmospheric requirements for preservation differ among items. Some produce items transmit or absorb odors. Others suffer damage from ethylene gas, which nearly all fresh produce emanates. Finally, chemicals used on some produce items to inhibit fungus growth and rot will contaminate other produce items, rendering them unfit for consumption. Table 1 demonstrates storage compatibility of commodities selected for study in this survey.

Fresh produce requires relatively low temperatures for two reasons. At such low temperatures the respiration rate of live products and the growth rate of bacteria and fungi are retarded. Since both fresh produce and decay-producing microorganisms are alive--in the sense that they respire and conduct chemical reactions--reducing the temperature of the organisms' environment increases the dormancy of the organisms. Each commodity, however, has a low-temperature tolerance below which cell damage occurs. Extensive cell damage renders fresh produce unmarketable. Thus, the temperature at which cell damage occurs constitutes the lower limit for storage temperatures. Ideal shipping and storage temperatures vary by commodity (table 1). Note the high storage temperatures required by grapefruit and lemons in comparison with temperatures shown for other commodities.

Relative humidity must be high to prevent shrinkage during storage or shipment. High humidity, however, is conducive to the growth of mold. Depending on the type of mold and the susceptibility of the commodity to shrinkage, a relative humidity must be selected which permits the least shrinkage with a tolerable level of mold growth. A somewhat complex system of tradeoffs can be seen here: Humidity retards shrinkage in the produce item, but promotes fungus growth. Low temperatures retard maturation, but can cause cell damage. As an additional complicating factor, optimal levels of temperature and humidity tend to vary among types of commodities.

In many instances the required levels of temperature and humidity form a favorable environment for decay-producing organisms. Chemicals must then be introduced to retard this growth. Use of chemicals with fresh produce must be carefully controlled to prevent contamination. 3/

3/ EEC acceptance tolerances limit biphenyl content of citrus to 70 PPM. See Overseas Shipping Test of California Citrus on Pallets and in Containers--Interrelations Between Transit Temperatures, Biphenyl Pad Placement, Biphenyl Content, and Fruit Condition, by G. L. Rygg, U. S. Dept. Agr., Mktg. Res. Rep. 857, Oct. 1969.

Table 1.--Temperature and humidity levels for storage of selected produce items 1/

Commodity	Acceptable temperature 2/	Relative humidity 2/	Comments
	Degrees F.	Percent	
Fresh apples	30-34	90	Produces ethylene gas at high rate. Gives off readily absorbed odors not compatible with citrus.
Fresh table grapes	30-34	85	Fumigated with sulfur dioxide which is harmful to most other produce.
Lettuce	30-34	95	Highly susceptible to ethylene contamination.
Fresh grapefruit:			
Mar. to Aug.	50-54	85-90	Treated with biphenyl.
Sept. to Feb.	55-59	85-90	Treated with biphenyl.
Fresh oranges:			
California	40-44	85-90	Treated with biphenyl.
Florida	30-34	85-90	Treated with biphenyl.
Temples	35-39	85-90	Very short storage life (10 days).
Fresh lemons	55-59	85-90	Should be ventilated to remove ethylene gas. Treated with biphenyl.
Fresh limes	45-49	85-90	Should be ventilated to remove ethylene gas. Treated with biphenyl.

1/ Temperatures should be close to midpoint of the range.
2/ Source: Agriculture Handbooks 66 and 195.

Waste products of fresh produce items can contaminate other items. Ethylene gas, produced by most fleshy fruits, speeds maturation and coloration of other plants. For example, when green peppers are stored with apples, the peppers will ripen and turn red in a relatively short time. Russet spotting in lettuce will also increase where ethylene is present. In short, storage life is considerably shortened for commodities stored in the presence of ethylene gas. Because ethylene speeds the maturation process, even the parasitic diseases seem to grow faster. Therefore, it is preferable to keep ethylene-producing commodities separated from other commodities. Few commodities produce ethylene at the same rate. If two ethylene-producing commodities are stored together, danger of affecting one of them exists. For example, apples and oranges are both ethylene producers; however, apples produce more than oranges. When stored with apples, oranges tend to change color at an accelerated rate.

Odor absorption by fresh commodities is another problem in storage. Most deciduous fruits are susceptible to odors, particularly those produced by citrus and by root-type commodities such as potatoes and onions. Deciduous fruit should, therefore, not be stored with any strongly scented commodity.

The distribution system for fresh fruits and vegetables must offer temperature and humidity control. It must also provide a means for preventing contamination of one commodity by another. This is normally accomplished by some combination of physical separation and ventilation.

Size of Shipment

An optimum size of shipment cannot be quantified because of lack of data on the Western European market for U.S. fresh fruits and vegetables. The optimum size of shipment is defined as the quantity that can be absorbed by a given market within the marketable life remaining after distribution. This quantity is related to the size of the market. As the geographic scope of the market is increased, the allowable size of shipment will also tend to increase. At the same time, the time needed to distribute commodities within the market will tend to increase. This, in turn, will tend to reduce the marketable life remaining after the final point of sale is reached.

Information Flows

Two critical points in any distribution system are these: When goods are to enter or leave a transportation system or storage, the carrier or storer and the receiver must know where the goods are located and that they should enter or leave the system. When goods are to change carriers or modes or both, the involved carriers must know that the goods are available and that an interchange should take place. At both of these points information must flow promptly or delays will result.

A third critical point can be identified for international shipments. The United States and many other countries typically require a large body of information concerning goods that are intended to leave or enter the country. Without this information, the goods will not be permitted to move. The information required to permit minimum functioning of a transportation system need only move at the same speed as the goods involved, but the system can function more efficiently if the information precedes the goods.

Up to this point only minimum requirements have been set forth. For efficient functioning of a distribution system, higher standards of information flow and availability must be attained. The information system must be capable of producing negative feedback. It is not enough to know that a shipment has arrived. The information system should be able to detect that an expected shipment has not arrived. This information, in turn, will be most useful when the information system can detect the actual location of a shipment in real time. Finally, the information system's product should be in a form that all concerned can readily understand.

EXPORT DISTRIBUTION SYSTEM PERFORMANCE

Shipper Survey

To obtain firsthand knowledge of the problems encountered by exporters of fresh fruits and vegetables and to gather data not otherwise available, a small number of produce shippers in Western States were contacted.

Methodology.

The Packer Produce Availability Guide shows the following numbers of marketing firms in the Western States:

Commodity handled	Number of firms
Apples	131
Grapefruit	53
Grapes	179
Lemons	14
Lettuce	198
Oranges	68
Total	643

Since many firms handle more than one category of produce, the actual population is likely to be somewhat smaller than the 643 shown above.

A survey conducted by the Economic Research Service in 1970 indicated that nine firms in the Pacific Northwest exported substantial quantities of apples to Europe. Four of these firms, accounting for 90 percent of the volume moving to Europe from the Pacific Northwest, were included in this survey.

Similar surveys were not available for the other categories of produce under consideration. Sampling of these categories was done under the assumption that large firms are most likely to participate in the export market. Slightly different size criteria were used to select firms for the several produce categories. The following tabulation shows the selection criteria and the number of firms resulting from application of the criteria. Shipment data for individual firms represent the 1969-70 season and were taken from The Packer Produce Availability Guide.

Commodity	Criterion pct. of total shipments	No. of firms selected	Pct. of total shipments accounted for
Grapes	More than 8.0	2	34.4
Lemons	More than 80.0	1	89.0
Lettuce	More than 4.0	5	44.8
Oranges	More than 4.0	3	80.6
Grapefruit	More than 4.0	6	60.8

The list of prospective firms was shown to representatives of trade organizations, the California State Department of Agriculture, Federal-State Market News Service, and commodity specialists in USDA. At their suggestion, certain firms were added to improve geographic coverage and include known participants in the export market. The final sample was as follows:

Commodity	No. of firms in sample	Pct. of total shipments accounted for
Grapes	4	39.9
Lemons	1	89.0
Lettuce	10	54.6
Oranges	5	80.6
Grapefruit	6	64.0
Apples	4	90.0
Total	30	

Several of the sample firms entered the sample for more than one commodity. For this reason, only 24 contacts were required.

Recognizing that the problem area contained many parameters which are difficult to quantify, a semistructured interview, utilizing an interview outline, was employed. This outline is shown in appendix I.

Survey Results

Of the 24 respondents contacted, four reported no direct participation in export marketing. Six firms reporting selling on a cost-insurance-freight (CIF) basis. Under these terms the seller provides and pays for transportation to a named foreign destination. 4/ Two of these firms conducted marketing operations in Western Europe. The remaining 14 firms sold free alongside ship (FAS) or free on board (FOB) only. These terms of trade differ and many variations exist within each term. 5/ Under both terms, however, control of the shipment passes to the buyer at the port of embarcation.

Since most of the firms contacted were only incidental participants in export marketing, very few complete responses were received. The majority of the firms contacted conducted their export activities in accordance with buyers' requests. Therefore, they did not make explicit distribution decisions.

The survey results are generally not deemed suitable for expansion to population estimates. Where survey data are used in this report, they should be treated as informed opinion rather than as compilation of fact.

Export Levels

The output of the distribution system considered in this study is shown in table 2.

Total exports of three of the six commodities shown declined between 1968 and 1970. Lemon exports to Western Europe decreased more than 59 percent, from 86.7 million pounds in 1968 to 35.8 million in 1970. In 1968 fresh grapefruit exports amounted to 20.8 million pounds, but the 14.4 million shown for 1970 represented a 33 percent decline. Fresh apples declined 56 percent from 38.3 to 19.1 million pounds in 1968-70.

Three commodities--fresh oranges, lettuce, and fresh grapes--showed marked increases in export volume during 1968-70. Fresh lettuce showed the greatest increase (69 percent), from 4.2 million pounds in 1968 to 7.1 million in 1970. Sweden accounted for the majority of lettuce shipments to Western European countries in all 3 years. On a relative basis, fresh grapes showed the second largest increase, 69 percent, followed by fresh oranges, 33 percent.

Western Europe, on the average, accounted for 20 percent or more of total exports of two commodities, apples (26 percent) and lemons (21 percent).

4/ Export and Import Procedures, Morgan Guaranty Trust Company of New York, 23 Wall St., New York, N.Y., March 1968, page 116.
5/ Ibid. 104-114.

years and average 1968-70 1/

Commodity and country	1968 Quantity	1968 Percent of total	1969 Quantity	1969 Percent of total	1970 Quantity	1970 Percent of total	Av. 1968-70 Quantity	Av. 1968-70 Percent of total
	1,000 lb.	Pct.	1,000 lb.	Pct.	1,000 lb.	Pct.	1,000 lb.	Pct.
Fresh lemons, total	263,367	100.00	235,286	100.00	281,542	100.00	260,065	100.00
Sweden	10,666	4.04	8,684	3.69	8,657	3.07	9,336	3.58
Netherlands	14,970	5.68	8,459	3.59	5,741	2.03	9,723	3.73
Belgium-Luxembourg	6,882	2.61	5,365	2.28	2,784	0.98	5,010	1.92
France	49,467	18.78	14,791	6.28	14,259	5.06	26,172	10.06
West Germany	1,147	0.43	2,137	0.90	3,150	1.11	2,145	0.82
United Kingdom	3,567	1.35	1,556	0.66	1,189	0.42	2,104	0.80
Total, selected countries	86,699	32.91	40,992	17.42	35,780	12.70	54,490	20.95
Fresh oranges, total	313,506	100.00	597,682	100.00	564,501	100.00	491,869	100.00
Sweden	542	0.17	3,630	0.60	2,323	0.41	2,165	0.44
Netherlands	2,230	0.71	18,790	3.14	4,112	0.72	8,377	1.70
United Kingdom	419	0.13	5,474	0.91	508	0.08	2,134	0.43
Belgium-Luxembourg	1,825	0.50	5,950	0.99	1,566	0.27	3,114	0.63
France	1,747	0.55	5,160	0.86	436	0.07	2,448	0.49
West Germany	41	0.01	1,222	0.20	106	0.01	456	0.09
Total, selected countries	6,804	2.17	40,226	6.73	9,051	1.60	18,694	3.80
Fresh grapefruit, total	176,196	100.00	264,887	100.00	226,564	100.00	222,549	100.01
Sweden	3,732	2.11	1,521	0.57	1,267	0.55	2,173	0.97
Netherlands	2,662	1.51	9,269	3.49	2,102	0.92	4,678	2.10
Belgium-Luxembourg	465	0.26	925	0.34	92	0.04	494	0.22
France	12,726	7.22	10,833	4.08	9,205	4.06	10,921	4.90
West Germany	697	0.39	4,164	1.57	1,626	0.71	2,162	0.97
United Kingdom	517	0.29	852	0.32	161	0.07	510	0.22
Total, selected countries	20,799	11.86	27,564	10.40	14,453	6.37	20,939	9.40

See footnote at end of table.

Continued

Table 2.--Exports of selected fresh fruits and vegetables to selected Western European countries, by years and average 1968-70 1/--Continued

Commodity and country	1968		1969		1970		Av. 1968-70	
	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total
	1,000 lb.	Pct.	1,000 lb.	Pct.	1,000 lb.	Pct.	1,000 lb.	Pct.
Fresh apples, total	102,012	100.00	89,569	100.00	108,913	100.00	100,165	100.00
Sweden	7,670	7.51	6,511	7.26	4,830	4.43	6,337	6.32
Netherlands	30,394	29.79	8,831	9.85	12,770	11.72	17,332	17.30
Belgium-Luxembourg	0	.00	8,170	9.12	1,090	1.00	3,087	3.08
France	37	0.03	8	2/	0	.00	15	0.01
West Germany	0	.00	618	0.68	396	0.36	338	0.33
United Kingdom	225	0.22	135	0.15	0	.00	120	0.11
Total, selected countries	38,326	37.57	24,273	27.09	19,086	17.52	27,228	27.18
Fresh lettuce, total	264,404	100.00	279,494	100.00	250,518	100.00	264,805	100.00
Sweden	2,789	1.05	2,564	0.91	6,133	2.44	3,829	1.44
Netherlands	207	0.07	24	2/	684	0.27	305	0.11
United Kingdom	72	0.02	25	2/	33	0.01	43	0.01
West Germany	223	0.08	76	0.02	189	0.07	163	0.06
Belgium-Luxembourg	897	0.33	2,009	0.71	38	0.01	981	0.37
France	0	.00	31	0.01	0	.00	10	2/
Total, selected countries	4,188	1.58	4,729	1.69	7,077	2.82	5,331	2.01
Fresh grapes, total	229,878	100.00	279,564	100.00	232,763	100.00	247,402	100.00
Sweden	3,128	1.36	1,943	0.69	3,228	1.38	2,766	1.11
United Kingdom	551	0.23	4,523	1.61	2,877	1.23	2,650	1.07
Netherlands	186	0.08	656	0.23	368	0.15	403	0.16
West Germany	39	0.01	332	0.11	306	0.13	226	0.09
Belgium-Luxembourg	190	0.08	136	0.04	6	2/	111	0.04
France	203	0.08	0	.00	46	0.01	83	0.03
Total, selected countries	4,297	1.86	7,590	2.71	6,831	2.42	6,239	2.52

1/ Individual country data obtained from U.S. Dept. Commerce, Bureau of the Census. Total exports obtained from U.S. Foreign Agricultural Trade Statistical Report, U.S. Dept. Agr., Econ. Res. Serv., 1969, 1970 and 1971 issues. 2/ Less than 0.5 percent.

Seasonality

All of the shippers surveyed said that their export shipments of the fresh fruits and vegetables considered in this study were highly seasonal. To test their statements, indexes of seasonality were computed for each commodity and country included in the study. These indexes were computed by the method of ratio to moving average, using monthly data for 1967-70. 6/ The index values shown are the typical seasonal relatives (tables 3 to 8). The method of ratio to moving average distributes 1,200 index points among 12 months. A total lack of seasonality would result in each month receiving 100 index points. For this study, 200 or more index points are assumed to indicate significant seasonality in a given month.

With the exception of countries which received only small quantities or none of a given commodity, all of the index series show substantial seasonality. The degree of seasonality found varied widely among both commodities and recipient countries.

Size of Shipment

Data showing size or number of shipments are not available. Data reflecting monthly shipments of each commodity to each country were obtained from the Bureau of the Census and the Foreign Agricultural Service, USDA, and are used as a proxy for average size. The average shipment size for each combination of commodity and country was estimated from the above data (table 9).

Assuming that shipments of a given commodity to a given country from a single U.S. port were spread uniformly and took place at the rate of one per week (such an assumption is consistent with a regular supply at destination), shipments would vary in size from about one-third truckload to 19 truckloads. This implies that (1) the distribution system utilized must possess great flexibility and (2) the relatively low rates available for bulk carriage in ocean vessels are seldom usable by exporters of fresh fruits and vegetables. Because few produce items can be safely carried in the same hold, opportunities to accumulate shipload quantities by mixing loads are rare. To gain the cost advantages of shipload quantities, a break-bulk function would be required at the European port of debarcation. Such a function takes time and can be accomplished only at some cost. The marketable life of the commodity would, therefore, be reduced and at least some of the savings in ocean transportation costs would be consumed by additional distribution costs in Europe.

6/ Neter, J. and Wasserman, W., Fundamental Statistics for Business and Economics, Allyn and Bacon, Inc., Boston, Mass., 1957, pp. 578-588.

Table 3.--Fresh apples: Index of U.S. exports to selected countries by months (1967-70 base)

Month	The Netherlands	United Kingdom	West Germany	Sweden	Benelux	France
January	0	343	0	446	0	0
February	0	258	0	48	0	0
March	0	119	0	2	0	0
April	991	39	0	10	1,092	0
May	209	9	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
August	0	0	0	0	0	0
September	0	13	0	0	0	0
October	0	49	0	8	0	0
November	0	117	0	109	0	0
December	0	253	0	577	108	0

Table 4.--Fresh lettuce: Index of U.S. exports to selected countries by months (1967-70 base)

Month	The Netherlands	United Kingdom	West Germany	Sweden	Benelux	France
January	0	0	1,200	99	0	0
February	49	0	0	275	0	0
March	479	1,200	0	264	0	0
April	476	0	0	196	0	0
May	92	0	0	94	0	0
June	0	0	0	54	0	0
July	0	0	0	0	0	0
August	0	0	0	0	0	0
September	0	0	0	17	0	0
October	0	0	0	73	0	0
November	0	0	0	40	0	0
December	104	0	0	88	0	0

Table 5.--Fresh grapefruit: Index of U.S. exports to selected countries by months (1967-70 base)

Month	The Netherlands	United Kingdom	West Germany	Sweden	Benelux	France
January	2	.0	0	79	0	98
February	15	0	0	118	86	186
March	75	112	277	306	0	221
April	185	675	343	180	0	127
May	103	185	46	50	0	49
June	40	24	0	10	243	118
July	55	0	0	13	107	68
August	16	144	0	130	0	22
September	111	0	57	66	281	18
October	348	0	279	161	472	118
November	227	23	132	39	0	132
December	22	36	65	46	11	42

Table 6.--Fresh oranges: Index of U.S. exports to selected countries by months (1967-70 base)

Month	The Netherlands	United Kingdom	West Germany	Sweden	Benelux	France
January	0	0	0	0	0	0
February	0	0	0	0	0	0
March	0	0	0	143	0	0
April	65	168	0	224	24	0
May	471	265	716	330	186	161
June	309	326	85	219	167	463
July	222	276	235	86	296	411
August	94	122	153	173	289	89
September	14	30	12	25	71	8
October	0	0	0	0	0	0
November	25	0	0	0	167	0
December	0	13	0	0	0	68

Table 7.--Fresh lemons: Index of U.S. exports to selected countries by months (1967-70 base)

Month	The Netherlands	United Kingdom	West Germany	Sweden	Benelux	France
January ...	60	58	0	21	195	145
February ..	81	80	55	134	84	95
March	167	174	169	127	267	137
April	172	202	206	113	29	85
May	43	154	98	132	9	54
June	30	0	163	131	0	45
July	110	153	371	177	31	165
August	57	176	73	125	12	126
September .	59	33	0	38	75	67
October ...	178	36	65	101	189	109
November ..	152	94	0	50	206	68
December ..	91	40	0	50	104	103

Table 8.--Fresh grapes: Index of U.S. exports to selected countries by months (1967-70 base)

Month	The Netherlands	United Kingdom	West Germany	Sweden	Benelux	France
January ...	340	267	0	148	0	0
February ..	0	29	0	30	0	0
March	0	0	0	0	0	0
April	0	0	0	0	0	0
May	0	0	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
August	0	0	0	0	0	0
September .	0	0	0	0	0	0
October ...	0	119	0	57	0	0
November ..	0	267	0	334	0	0
December ..	858	517	1,200	630	1,200	0

Table 9.--Average volume of selected U.S. fruits and vegetables shipped to selected countries, in one month, 1967-70

Commodity	Netherlands	United Kingdom	West Germany	Sweden	Benelux	France
	---------- Million pounds ----------					
Fresh apples	1.110	2.830	0.066	1.288	0.254	0.097
Fresh lemons	0.936	0.421	0.440	0.768	0.634	2.696
Fresh oranges	1.730	0.838	0.333	0.500	0.582	1.184
Fresh grapefruit	0.616	0.231	0.413	0.229	0.191	0.498
Fresh lettuce	0.063	0.046	0.043	0.329	0.241	0.016
Fresh grapes	0.256	0.454	0.090	0.503	0.062	0.084

Flow Patterns

Export data obtained from the Bureau of the Census and the Foreign Agricultural Service were utilized to determine the flow patterns shown in tables 10 to 16. These data reflect shipments moving from the customs districts shown to the Western European countries considered in this study. Some customs districts include more than one port. New York, N. Y., for example, includes New York, N. Y.; Albany, N. Y.; Newark, N. J.; Perth Amboy, N. J.; and John F. Kennedy International Airport.

Complete defintions of the geographic area included in each customs district are shown in Schedule D--Code Classification of the United States Customs Districts and Ports Used in Compiling the United States Foreign Trade Statistics, U.S. Department of Commerce, Bureau of the Census, Washington, D. C.

Fresh Oranges

Los Angeles is the leading port of embarcation of fresh oranges, averaging 49 percent of the total exports during 1967-70 (table 10). Los Angeles showed continued increases in market share over the period shown. In 1970, Los Angeles accounted for more than 96 percent of all fresh orange exports to the countries under consideration.

Fresh Grapefruit

During 1967-70, New York averaged 34 percent of the volume, leading all other U.S. ports (table 11). Los Angeles was second with 25 percent, closely followed by Miami, Fla., with 20 percent.

Table 10.--Exports of fresh oranges to selected European countries by customs districts, 1967-70

Customs district	1967		1968		1969		1970		Average 1967-70	
	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total
	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent
New York, N.Y.	29,475	36.5	3,934	57.8	2,384	5.9	19	1/	8,953	21.2
Philadelphia, Pa.	434	0.5	--	--	--	--	--	--	434	1.0
Norfolk, Va.	1,551	1.9	--	--	104	1/	--	--	828	2.0
Savannha, Ga.	450	0.6	--	--	--	--	--	--	450	1.1
Tampa, Fla.	6,424	8.0	112	1.6	261	0.6	4	1/	1,700	4.0
Galveston, Tex.	--	--	--	--	6,287	15.6	--	--	6,287	14.9
Los Angeles, Calif.	41,538	51.4	2,758	40.5	29,479	73.3	8,724	96.4	20,625	49.0
San Francisco, Calif.	851	1.0	--	--	88	1/	47	0.5	986	2.3
Seattle, Wash.	--	--	--	--	--	--	250	2.8	250	0.6
Miami, Fla.	--	--	--	--	1,620	4.0	7	1/	1,620	3.8
Total	80,723	100.0	6,804	100.0	40,223	100.0	9,051	100.0	42,133	100.0

1/ Less than 0.5 percent.

Table 11.--Exports of fresh grapefruit to selected European countries by customs districts, 1967-70

Customs district	1967		1968		1969		1970		Average 1967-70	
	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total
	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent
Boston, Mass.	93	1/	80	1/	--	--	--	--	86	1/
New York, N.Y.	31,515	57.2	6,456	31.0	7,663	27.8	2,971	20.6	12,151	33.9
Philadelphia, Pa.	406	0.7	--	--	--	--	--	--	406	1.1
Baltimore, Md.	--	--	284	1.4	413	1.5	615	4.2	437	1.2
Norfolk. Va.	447	0.8	1,176	5.6	2,106	7.6	3,580	24.8	1,827	5.1
Wilmington, N.C.	--	--	--	--	--	--	400	2.8	400	1.1
Charleston, S.C.	--	--	128	0.6	--	--	--	--	128	1/
Savannah, Ga.	40	1/	79	1/	744	2.7	677	4.7	385	1.1
Tampa, Fla.	3,518	6.4	2,749	13.2	4,284	15.5	3,357	23.2	3,477	9.7
Galveston, Tex.	5	1/	--	--	215	0.8	6	1/	75	1/
Laredo, Tex.	266	0.5	15	1/	62	1/	--	--	114	1/
Los Angeles, Calif.	18,769	34.0	9,577	46.0	4,586	16.6	2,741	19.0	8,918	24.9
San Francisco, Calif.	--	--	--	--	195	0.7	2	1/	98	1/
Miami, Fla.	--	--	--	--	7,248	26.3	--	--	7,248	20.2
Houston, Tex.	72	1/	255	1.2	49	1/	104	0.7	120	1/
Total	55,131	100.0	20,799	100.0	27,565	100.0	14,453	100.0	35,870	100.0

1/ Less than 0.5 percent.

Several trends can be discerned which would appear to be more meaningful than the 4-year averages shown in table 11. New York showed a steady decrease in market share. In 1967, New York accounted for 57 percent of the grapefruit exports shown. By 1970, New York's share had declined to about 21 percent. Norfolk, Va., in contrast, led New York in 1970 with nearly 25 percent of the volume shown. In 1967, Norfolk had accounted for less than 1 percent. Tampa, Fla., also showed substantial increases during 1967-70. In these years, Tampa rose from 6 to 23 percent of the exports shown. In sharp contrast to its performance for fresh oranges, Los Angeles showed marked fluctuation ranging from 46 percent (1968) to 17 percent (1969). The total volume of fresh grapefruit shipped to Western Europe declined 74 percent during the years shown.

Fresh Lemons

Los Angeles accounted for 73 percent (1967) to 99 percent (1970) of fresh lemon exports to Western Europe (table 12). As was the case for the other citrus items, exports of fresh lemons declined dramatically, 65 percent, between 1967 and 1970.

Fresh Apples

Portland, Oreg., averaged 36 percent of the volume shipped to Western Europe between 1967 and 1970 (table 13). Portland and Seattle combined accounted for 57 percent on the average. Although New York averaged 34 percent of the volume and accounted for 47 percent in 1967, it seems likely that much of this volume represents production from eastern U.S. growing regions. Western grown fresh apples would appear to be exported through ports in the Pacific Northwest. This conclusion is also supported by conversations with Western apple packers.

Fresh Lettuce

Lettuce exports to Western Europe more than quadrupled, from 1.7 to 7.1 million pounds in 1967-70 (table 14). Exports of fresh lettuce to Western Europe chiefly use New York as the port of embarcation. This city averaged 72 percent of the fresh lettuce exports during 1967-70 and was as high as 96 percent in 1967. Baltimore and Los Angeles averaged 10 and 9 percent respectively. Exports through these two cities show marked fluctuations over the 4-year period.

Since little lettuce is grown near New York, it is somewhat surprising to see that city dominating lettuce export movements. Two factors appear to be operating. New York offers more sailings to Western Europe than any other U.S. port. Thus the probability of obtaining shipping space is relatively high at New York. New York City is the largest domestic market for lettuce. The lettuce shippers interviewed indicated that New York was selected as a point of embarcation because of the ease with which lettuce could

Table 12.--Exports of fresh lemons to selected European countries by customs districts, 1967-70

Customs district	1967		1968		1969		1970		Average 1967-70	
	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total
	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent
New York, N.Y.	27,135	36.6	2,985	3.4	2,845	6.9	160	1/	8,281	12.1
Philadelphia, Pa.	433	1/	--	--	--	--	--	--	433	0.6
Baltimore, Md.	--	--	40	1/	--	--	120	1/	80	1/
Norfolk, Va.	240	1/	204	1/	317	0.8	149	1/	228	1/
Galveston, Tex.	--	--	--	--	1,693	4.1	--	--	1,693	2.5
San Diego, Calif.	--	--	1,127	1.3	--	--	--	--	1,127	1.6
Los Angeles, Calif.	74,334	72.8	81,615	93.8	35,533	86.7	35,351	98.8	56,708	82.7
San Francisco, Calif.	20	1/	1,038	1.2	604	1.5	--	--	--	--
Total	102,162	100.0	87,009	100.0	40,992	100.0	35,780	100.0	68,550	100.0

1/ Less than 0.5 percent.

Table 13.--Exports of fresh apples to selected European countries by customs districts, 1967-70

Customs district	1967		1968		1969		1970		Average 1967-70	
	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total
	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent
Boston, Mass.	5,557	7.1	3,616	9.4	--	--	1,615	8.5	3,596	8.8
New York, N.Y.	36,840	46.9	11,130	29.0	3,937	16.3	3,029	15.9	13,734	33.5
Philadelphia, Pa.	--	--	--	--	41	1/	108	0.6	74	1/
Baltimore, Md.	132	1/	71	1/	68	1/	339	1.8	152	1/
Norfolk, Va.	4	1/	--	--	112	0.5	--	--	58	1/
San Francisco, Calif.	--	--	--	--	73	1/	62	1/	68	1/
Portland, Oreg.	23,632	30.1	16,301	42.5	9,245	38.2	9,638	50.5	14,704	35.8
Seattle, Wash.	12,420	15.8	7,208	18.8	10,696	44.2	4,295	22.5	8,655	21.1
Total	78,585	100.0	38,326	100.0	24,172	100.0	19,086	100.0	41,041	100.0

1/ Less than 0.5 percent.

Table 14.--Exports of fresh lettuce to selected European countries by customs districts, 1967-70

Customs district	1967		1968		1969		1970		Average 1967-70	
	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total
	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent
Boston, Mass.	--	--	--	--	--	--	100	1.4	100	2.3
New York, N.Y.	1,621	95.9	3,586	85.6	3,293	69.6	5,724	80.9	3,151	71.8
Baltimore, Md.	--	--	90	2.1	28	0.6	1,215	17.2	444	10.1
Norfolk, Va.	--	--	--	--	24	0.5	--	--	24	0.5
Los Angeles, Calif.	4	1/	310	7.4	1,170	24.7	39	0.6	381	8.7
San Francisco, Calif.	--	--	2	1/	214	4.5	--	--	108	2.5
Portland, Oreg.	66	3.9	111	2.6	--	--	--	--	88	2.0
Seattle, Wash.	--	--	89	2.1	--	--	--	--	89	2.0
Total	1,691	100.0	4,188	100.0	4,729	100.0	7,078	100.0	4,385	100.0

1/ Less than 0.5 percent.

Table 15.--Exports of fresh grapes to selected European countries by customs districts, 1967-70

Customs district	1967		1968		1969		1970		Average 1967-70	
	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total
	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent
New York, N.Y.	4,326	51.0	3,105	72.3	2,158	28.4	2,020	29.6	2,902	41.4
Baltimore, Md.	--	--	208	4.8	--	--	--	--	208	3.0
Norfolk, Va.	--	--	10	1/	84	1.1	--	--	47	0.7
Los Angeles, Calif.	52	0.6	214	5.0	400	5.3	764	11.2	358	5.1
San Francisco, Calif.	4,098	48.3	745	17.3	4,948	65.7	3,972	58.1	3,441	49.1
Portland, Oreg.	--	--	14	1/	--	--	77	1.1	46	0.6
Total	8,476	100.0	4,296	100.0	7,590	100.0	6,833	100.0	7,002	100.0

1/ Less than 0.5 percent.

be diverted from the export to the domestic market. The single surveyed shipper maintaining offices in New York indicated that certain export shipments of lettuce are assembled in that city because of the large quantity of lettuce normally available in the New York wholesale market. An additional factor seems likely to be the uncertainty of scheduling rail-ship connections at New York (see below).

Fresh Grapes

The total volume of fresh grapes exported to Western Europe showed severe fluctuations in 1967-70 (table 15). On the average, New York (49 percent) and San Francisco (41 percent) accounted for roughly equal shares of the market. On an annual basis the share of each of these ports varied widely.

Scheduling

Surveyed shippers were more displeased with the lack of regularity in rail service to eastern markets and ports than with the relatively slow transit time, 10 days, obtained from railroads. The degree of regularity was not measured, but the problem caused by the lack of regularity can be seen in the following narrative.

Conventional cargo ships require approximately 5 days to work cargo. 7/ Any shipment scheduled to arrive at the ship on the first day the ship is in port could be delayed as much as 4 days without missing the ship's departure. Container ships, in contrast, spend 24 hours or less in port. Any delay in domestic transit will, thus, result in missing the container ship's departure. If domestic transit cannot be made to conform to some schedule, the benefits of container ships may be denied exporters of fresh produce. It should be recognized that early delivery may not be a viable solution. Such deliveries will result in storage costs which detract from the benefits of containerized transportation. These costs for produce items would be the sum of direct charges for storage, demurrage, detention, and so on, and the indirect costs of reduced marketable life.

Historically, steamship service has been provided by a large number of operators offering relative uniformity in physical configuration of vessels and quality of service. The result with regard to scheduling was that missing a given ship was relatively unimportant. Another similar vessel would be available in a short time. 8/ In the future each major sea route may be served by a relatively few large, fast container ships. 9/ As the number of ships serving a route declines, the penalties stemming from missing a vessel's departure will become more severe.

7/ The Impact of Containerization on the U. S. Economy, Vol. II, Matson Research Co., San Francisco, Calif., Sept. 1970, page 77.
8/ Loc. cit. pp. 22-23.
9/ Loc. cit. page 23.

Handling

Agricultural Research Service personnel, especially those at Antwerp, Belgium, report that U. S. produce frequently arrives at Western Europe in a damaged condition. While conducting the survey, one of the authors was shown correspondence indicating that certain cargoes had been severely damaged while in a vessel's hold. These damages are more the result of inattention and ignorance on the part of the stevedores and ship's company than any lack of technology. In the course of this study, actual loading practices were observed that resulted in damage to the fruit from the loading and stowing techniques employed. In the loading scene observed, using slings with four instead of two spreaders and 12-inch versus 4-inch lumber for dunnage would have resulted in much less damage.

At another location it was observed that the thermometers in the second and higher tiers of refrigerated containers could not be read from ground level. At this same location a container was observed leaking water (an indication that the contents were thawing) and another container was found with an internal temperature well above the ambient temperature of about 42° F. An employee explained that the refrigeration equipment on both containers had stopped, but the employee had been able to restart them. The employee did not realize that both loads were surely spoiled.

Further, there appeared to be no means of discerning if the temperature shown on a container's thermometer was the proper temperature. So long as the refrigeration equipment was operating, the container's load was judged to be satisfactory. Since fruits and vegetables are quite sensitive to temperature and differ widely in temperature requirements, it seems reasonable to believe that substantial spoilage exists in containerized shipments of perishables.

The core problems are found in the exterior design of containers and in the training of longshoremen.

Information Flows

Discussions with the industry indicate that satisfactory information is seldom available. Railcars arrive late at destination or are lost entirely. Shipments are held at dockside in Europe because needed documents have not arrived. Shippers are told well after the fact that their shipment was unacceptable or of reduced quality.

Managerial Control

Only six of 24 firms contacted controlled the distribution function between the United States and Europe and only two of these exerted control beyond the European port. As the firms contacted tended to be substantially larger than the industry average, it is likely that very few Western U. S. packing houses exert substantial control of export distribution.

This lack of control minimizes the market knowledge available to the shipping firm. As most of the firms interviewed had no contact with European buyers, they had no knowledge of European business practices or the preferences of European consumers. As the absolute volume of trade is rather low, U.S. packers are aware that their product does not satisfy the demands of European consumers. The nature of the dissatisfaction is not known, and U.S. firms have little market intelligence upon which to base changes in the price, quality, or nature of product mix offered. Middlemen and exporters do not appear to be supplying such knowledge.

The large distances in terms of both geography and length of the marketing chain, between U.S. shippers and the Western European market are apparent causes of the problem outlined above. One might argue, however, that modern communications technology has removed, at least, the barriers created by distance. There is another barrier. In addition to the usually conceived limiting factors of land, labor, capital, and technology, the quantity of managerial attention available in a firm is also fixed in the short run. Representatives of several firms said they would not actively enter export marketing until they believed the returns from such activities would justify assignment of a full-time manager. Such an attitude could represent circular reasoning: A full-time manager will not be assigned until export revenues cover the costs of assignment, but without a full-time manager, export revenues will not cover the costs of a full-time manager.

Firm Size

With the exception of two cooperatives, the firms interviewed reported difficulty in gathering sufficient volume to make export shipments. The average firm was unable to gather a shipload-sized shipment without denying domestic customers, and all firms indicated that they would not deny a domestic customer in favor of the overseas market. As a result, the economies of scale available from shipload-sized shipments are usually not available to Western U.S. shippers. Since shipments of the size desired by importers could not be assembled on a regular basis, the regular flow needed to establish the United States as a reliable source of supply in the minds of Western Europe's buyers does not exist. As a partial answer, the produce industry has formed a number of complex interfirm agreements. These agreements have been short lived and frequently have formed the basis for distrust.

With regard to managerial attention, many firm managers reported that forming and implementing these agreements caused the manager to devote an undue amount of time to the export market.

There appears to be a need for an institution that could devote adequate managerial attention to export marketing and be capable of gathering economically sized shipments on a regular basis. Three such institutions appear available. The Webb-Pomerene Act of 1918 allows businesses to form export trade associations exempt from certain provisions of the Sherman and Clayton Antitrust Acts. The Revenue Act of 1971 permits formation of dom-

estic international sales corporations (DISC). DISC's are entitled to special tax treatment. So long as the earnings of a DISC are used in its export business, Federal income taxes are deferred on one-half of the corporation's export earnings. 10/ Finally, the marketing cooperative seems to offer a viable institution for export marketing. Such a cooperative might, in fact, choose to rely on the Webb-Pomerene Act or the Revenue Act of 1971 as the legal basis of forming thé cooperative.

It would appear desirable for the produce industry to evaluate the economic viability of such marketing cooperatives.

Tariff Barriers

All respondents surveyed reported that tariff levels of the European Economic Community (EEC) constituted a major barrier to increased exports of fresh fruits and vegetables. Table 16 shows the tariffs applicable to shipments of fresh fruits and vegetables from the United States to EEC nations. In addition to the ad valorem rates shown, the EEC can require a "compensatory tax" under certain conditions. To date, however, such taxes have not been levied against U.S. produce.

EEC tariff rates tend to be highest in months of U.S. harvest. This tends to result in relatively high prices for U.S. produce in EEC markets.

To gain perspective of the importance of EEC tariffs, it is instructive to examine the price spreads that have existed in U.S. markets. Table 17 shows the shipping point-wholesale price spread at New York, the amount received by the transportation agency and the primary wholesaler, and this spread as a percent of retail sales price. Except for grapefruit, for which only data reflecting Florida origins were available, the shipments represented are from Western origins to New York.

The price spreads shown vary substantially among shipping seasons, commodities, and varieties of the same commodity. Wholesale prices also show wide variations among seasons.

The tariff for navel oranges tends to be larger than the domestic shipping point-wholesale spread. For head lettuce the tariff rate is approximately one-half the domestic spread. EEC tariffs for the other commodities considered can be seen to equal a significant fraction of the domestic shipping point-wholesale spread. These data indicate that EEC tariffs are, in fact, significant barriers to increased exports of U.S. produced fresh fruits and vegetables. Also, because EEC rules permit the imposition of "compensatory taxes" on any fresh produce items, the EEC could countervail any price reduction effected by U.S. shippers. Further, the EEC tariff rate is applied to the value of the commodity at the EEC port. As this value

10/ DISC Handbook for Exporters, Dept. Treasury, Washington, D.C., January 1972, pp. 1-3.

Table 16.--Tariff rates for selected commodities entering EEC countries, September 1972 1/

Commodity	Dates when rates apply	Rate
		Pct.
Oranges	Oct. 16-Mar. 31	20
	April 1-May 31	15
	June 30-Sept. 30	5
	Oct. 1-Oct. 15	15
Lemons	--	8
Grapefruit ..	--	4
Apples	Aug. 1-Dec. 31	14
	Jan. 1-Mar. 31	10
	April 1-July 31	8
Grapes	Nov. 1-July 14	18
	July 11-Oct. 31	22
Head lettuce	April-Nov. 30	15
	Dec. 1-Mar. 31	13

1/ Customs Tariff of the European Community, Office of the Special Representative for Trade Negotiation, GPO, Washington, D.C.

includes export transportation in addition to U. S. wholesale cost, the EEC levy tends to be larger than the shipping point-wholesale spread.

Documentation

As many as 28 firms and Government agencies have been found to participate in a single export shipment. 11/ Over the years each party has tended to design and insist on the use of special forms to meet its own data needs.

11/ Paperwork or Profits $? in International Trade, Committee on International Trade Documentation and the Office of Facilitation, Department of Transportation, New York, N. Y., 1971. This is the primary source of data used in this section.

Table 17.--Shipping point-wholesale average price spreads for selected fresh produce items in New York, N.Y., seasons 1961-62 to 1966-67 1/

Season	Washington apples		Florida grapefruit		California lemons		California navel oranges	
	Shipping point-wholesale spread	Shipping point-wholesale spread as a percentage of retail value	Shipping point-wholesale spread	Shipping point-wholesale spread as a percentage of retail value	Shipping point-wholesale spread	Shipping point-wholesale spread as a percentage of retail value	Shipping point-wholesale spread	Shipping point-wholesale spread as a percentage of retail value
	Dol./ctn.	Percent	Dol./ctn.	Percent	Dol./ctn.	Percent	Dol./ctn.	Percent
1961-62	1.84	19	2/	2/	2/	2/	2/	2/
1962-63	1.63	18	2/	2/	1.17	13	0.68	9
1963-64	1.35	16	1.51	12	1.20	16	1.31	18
1964-65	1.17	12	1.91	15	1.50	17	0.65	10
1965-66	1.63	16	1.65	15	1.59	18	1.05	16
1966-67	2.69	25	1.11	11	0.91	10	0.74	12

Season	California valencia oranges		California Thompson seedless grapes		California iceberg lettuce	
	Shipping point-wholesale spread	Shipping point-wholesale spread as a percentage of retail value	Shipping point-wholesale spread	Shipping point-wholesale spread as a percentage of retail value	Shipping point-wholesale spread	Shipping point-wholesale spread as a percentage of retail value
	Dol./ctn.	Percent	Dol./ctn.	Percent	Dol./ctn.	Percent
1963	2.72	33	1.77	22	1.98	36
1964	2.06	24	2.00	24	2.14	35
1965	2.07	32	1.26	16	1.81	31
1966	1.78	24	0.95	11	1.94	30
1967	1.56	24	0.84	9	2.16	34

1/ Based on Prices and Spreads for Apples, Grapefruit, Grapes, Lemons and Oranges Sold in Selected Markets 1962/63-1966/67, U.S. Dept. Agr., Mktg. Res. Rep. 888, 1970 and Prices and Spreads for Potatoes, Sweet Potatoes, and Other Selected Vegetables Sold in Fresh Markets, 1962/63-1966/67, U.S. Dept. Agr., Mktg. Res. Rep. 901, 1970.
2/ Not available.

Despite similarities of purpose and data requirements, the lack of a systematic approach to document preparation and processing has resulted in a substantial burden to international trade.

The exact extent of the burden depends on the commodities, the modes used (both internationally and domestically), the terms of trade, and the countries involved. Since it is impractical to treat such a large number of variables in a report of this nature, the following discussion will treat the problems of documentation on an average basis.

Volume of Documents

Problem. A total of 19 export documents are most frequently used for shipments originating in the United States. The cost of preparing these documents averages $94.52 per shipment. The cost of processing averages $281.25. The total cost is $375.77 per shipment. In addition, 33 other documents are less frequently used. Of these 33 documents only 32 can be required for any one ocean shipment while only 30 can be required for an air shipment. Depending on the mode used, preparation and processing of these documents could add from $641.18 (ocean) to $623.77 (air) to the cost of each shipment.

Finally, there are 43 special documents. The cost of preparing and processing these documents ranges from less than $1 to more than $8,000. Included in these is the Inspection Certificate, U.S. Department of Agriculture. Total cost of preparing and processing this document adds $5.31 to the cost of a shipment. In general the 43 special documents represent a relatively small burden due to infrequent use.

Solution. In most instances the data in shipping documents are needed by the participating parties or required by law. It is unlikely that informational requirements can be greatly reduced. Modern reproduction techniques and automated data processing and transmission, however, offer substantial savings if information can be presented in standardized formats and if multiple originals are not required.

While a bill of lading is usually thought of as a contract between shipper and carrier, in its usual form, the bill of lading contains most of the information required to conduct or oversee a transaction.

At a minimum the bill of lading will contain the following information: (1) A description of the goods; (2) identification of: (a) consignor, (b) consignee, and (c) carrier(s); (3) specification of the probable route; and (4) specification of the freight charges.

With this basic information, considerable other information could be obtained by a moderate amount of research.

The Department of Transportation, in cooperation with the National Committee on International Trade Documentation, has designed a form titled

the "U.S. Standard Master." This form provides information in 87 areas. Substituting this form for nine of the most commonly used documents would result in estimated savings of $151.89 per shipment. 12/ In addition, certain procedural changes in the documentation and processing of letters of credit could be expected to reduce the cost of a single shipment by $80.77 for total savings of $232.66 per shipment. Substituting the U.S. Standard Master for 20 of the less frequently used documents would save an estimated $185.54 per shipment. 13/ Eliminating the "Authorization to Honor Drawings on Letter of Credit" would reduce costs by $3.17. Savings ranging from $232.66 to $421.37 per shipment appear available at the nominal cost of standardizing documentation and modifying current administrative procedures.

Flow of Documents

Problem. Documents now follow a sequential flow. It is frequently necessary or prudent to receive one or more documents before preparing the next document in the chain.

The ocean bill of lading is a basic document in international trade, from which other documents are prepared. Although the ocean bill of lading can move through channels in as little as 1 day, it appears that 18 days are more often required. 14/ Since a transcontinental shipment can be accomplished in 80 hours, it is apparent that the ocean bill of lading must usually be prepared well in advance of the domestic shipping date for intercontinental shipments originating in the Western States.

Two problems arise from this condition. A prospective seller's ability to react to a changing market is reduced. Further, the seller must devote substantial managerial attention to the smooth functioning of a complex system. The costs involved are difficult, if not impossible, to quantify. There is no question, however, that they are real and substantial.

Another problem area exists in the flow of documents. At certain points in the chain, the goods cannot move without proper documentation, but the documents seldom move by the same carriers and through the same channels as the goods. There are recorded incidents of perishables arriving in Europe a full week before the arrival of the documents required to allow their entry into the economy. A seller may find himself unable, in fact, to react to a market opportunity. To minimize the probability of such events, the seller must devote substantial managerial attention to scheduling and monitoring the twin systems of material and document flow.

Solution. Reducing the number of distinct documents would reduce the magnitude and complexity of the problem area outlined above. An equally

12/ Loc. cit., page 125.
13/ Loc. cit., page 126.
14/ Loc. cit., page 74.

fruitful solution would lie in agreement by all parties to take action on a trustworthy copy of a given document rather than insisting on receipt of the original. If such agreements could be reached, automatic data processing and transmission equipment could be used to distribute copies of documents nearly instantaneously. Such techniques would also permit presentation of information in convenient formats so as to reduce the clerical errors found in all manually produced document systems.

Interchange

All movements between the United States and Europe must involve more than one mode. Conceptually, interchanging freight between modes could involve only a single firm. In the existing distribution structure, most interchanges involve two firms even if no change of mode takes place. Such changes of firms invariably result in delays and costs. These costs, including the costs of delays, are not quantifiable. Their source is probably relatively poor communications and differences in operating procedures that exist between firms.

The following sections present some of the barriers to interchange and potential solutions to the problems these barriers raise.

Ocean shipping, inland waterways, railroads, highway carriers and, most recently, air carriers have developed in approximately the order shown. Due, in part, to each mode's developing at slightly different times, little effort was made to coordinate development. Each developing mode has obtained a portion of its traffic from the already developed modes, thus creating a spirit of rivalry rather than of cooperation.

Prior to 1935 some railroads developed truck service complementary to their own operations. Amendments to the Interstate Commerce Act in 1935 permitted such service to continue, but greatly restricted additional development of rail-owned truck service. The Act does not prohibit multimode firms, but raises a number of barriers to rail ownership of other modes.

Transportation legislation in the United States tends to compartmentalize the modes. Air, ocean, and land carriers are governed by separate legislation, administered by separate regulatory bodies. Since the rates and practices of all air, ocean, and rail carriers are regulated to some degree it is difficult to publish a multimodal through rate. Each segment of such a rate falls within the jurisdiction of a different regulatory body and is subject to somewhat different criteria. Although some efforts have been made to establish cooperation among regulatory bodies, the results still leave much to be desired.

A short discussion of the major regulatory differences serves to illustrate the problem created by differences in regulation.

Rate Regulation

All revenue traffic is subject to economic regulation. Section 203(b)(6) of the Interstate Commerce Act exempts motor carriers of unmanufactured agricultural commodities from economic regulation. As a result of this section, a class of motor carriers known as exempt for-hire truckers has come into being. These carriers are the principal participants in fresh fruit and vegetable motor traffic. Since these carriers are excluded from economic regulation by the Interstate Commerce Commission, it is difficult for the Commission to allow exempt motor carriers and railroads to enter into formal cooperative arrangements. To allow such agreements, the ICC would be forced to find unregulated truck rates to be just and reasonable.

Interchange of Traffic

Railroads are required to interchange traffic with other railroads and certain water carriers. Railroads are not required to interchange with motor carriers and motor carriers are not required to interchange traffic with any carrier. In addition, rail and regulated motor carriers' operating rights are fragmented geographically so that few transcontinental hauls can be made by a single carrier. Two conditions have tended to result from these circumstances: (1) The ICC has no effective means of enforcing cooperation across modal lines or among motor carriers. (2) Even where cooperation can be enforced, the fragmented operating rights create an unfortunate circumstance. Although a transcontinental shipper deals with either a single firm (the originating carrier) or, at most, two firms (the originating and terminating carriers), his shipment is accomplished by two or more firms. The intermediate and often the terminating carriers, who have no dealings with the shipper, may see no benefit in attempting to please the long-distance shipper. They believe (in the short term they are correct) that they will receive the same portion of the long-distance rate no matter what quality of service is supplied. This attitude can negate any efforts by the originating carrier to maintain a high quality of service.

Liability for Loss and Damage

In general, both rail and motor carriers are liable for any losses or damages that may occur to goods in their custody. Exempt for-hire carriers and water carriers are liable only as provided in their bills of lading. In the case of water carriers, the carrier may have no liability if the loss or damage was necessary to save the vessel.

Before a liability claim can be made, the responsible carrier must be identified. For rail and regulated motor carrier shipments, a shipper may file his claim with either the originating or the terminating carrier. These carriers may also proceed against other carriers party to the shipment. Air carriers, in contrast, are not liable after interchange with a connecting carrier.

The shipper is therefore confronted with a lack of uniformity in the statutes. His cost of pursuing a claim for loss or damage is often substantial. As produce is perishable, and produce prices fluctuate substantially, it is often difficult to determine the extent of carrier-caused damage or place a monetary value on the loss.

The confusion and risk that confront a shipper desiring intermodal service form a substantial barrier to the growth of such service. The carriers themselves, confronted with fragmented jurisdictions and varying requirements, may also be discouraged from entering into cooperative agreements and practices.

The problem is essentially the lack of uniformity in regulation. The five major problem areas are: (1) The liability issue. Clarification is needed as to what carrier is liable and to what extent in a multimodal shipment. (2) The jurisdictional issue. It is unclear which carriers must file interchange documents with what agencies. (3) The documentation issue. It is unclear what documents are required for multimodal shipments. Currently the kind, content, and issuing procedure of shipping documents differ among modes. (4) In many instances there is no authority under which joint rates may be established and none requiring establishment of joint rates. (5) In most instances there is no authority under which through rates may be established.

THE TRANSPORTATION SYSTEM

A major segment of any distribution system is the transportation system. This section contains an analysis of the transportation system available to Western fresh fruit and vegetable shippers for movements to Western Europe. This analysis does not explicitly consider movements from field to first point of pause. In most instances this point is a packing shed. Conceptually, however, fresh produce can move directly from field to pier, rail, or truck head.

Time and Distance

With the exception of lettuce, the commodities considered in this study have marketable lives of more than 28 days. As shown in table 18, the steaming time from West Coast ports to Europe never exceeds 20 days. The majority of the commodities under study can, therefore, be sealifted from West Coast ports.

It appears, however, that lettuce cannot be exported to Europe through the West Coast ports. The 14 to 21 days of marketable life shown for head lettuce tend to be consumed or exceeded by the voyage times required by West Coast sailings.

Interviews with shippers indicate that rail shipments require 10 to 12 days for shipments from California-Arizona points to New York. Trucks offer

Table 18.--Distances and approximate steaming time between selected U.S. and European ports 1/

U.S. port	Liverpool, England			Rotterdam, Netherlands			Le Havre, France			Hamburg, West Germany			Goteborg, Sweden			Stockholm, Sweden		
	Naut. miles	Vessel speed 21 kt.	Vessel speed 26 kt.	Naut. miles	Vessel speed 21 kt.	Vessel speed 26 kt.	Naut. miles	Vessel speed 21 kt.	Vessel speed 26 kt.	Naut. miles	Vessel speed 21 kt.	Vessel speed 26 kt.	Naut. miles	Vessel speed 21 kt.	Vessel speed 26 kt.	Naut. miles	Vessel speed 21 kt.	Vessel speed 26 kt.
		Days	Days		Days	Days		Days	Days		Days	Days		Days	Days		Days	Days
Boston, Mass.	3,030	6.0	4.8	3,187	6.3	5.1	2,996	5.9	4.8	3,450	6.8	5.5	3,626	7.2	5.8	4,303	8.5	6.9
New York, N.Y.	3,254	6.4	5.2	3,411	6.8	5.5	3,210	6.4	5.1	3,674	7.3	5.9	3,850	7.6	6.2	4,527	9.0	7.2
Philadelphia, Pa.	3,389	6.7	5.4	3,546	7.0	5.7	3,355	6.6	5.4	3,809	7.6	6.1	3,985	7.9	6.4	4,662	9.2	7.5
Baltimore, Md.	3,537	7.0	5.6	3,684	7.3	5.9	3,493	6.9	6.1	3,947	7.8	6.3	3,893	7.7	6.2	4,570	9.1	7.3
Norfolk, Va.	3,404	6.8	5.4	3,561	7.1	5.7	3,370	6.7	5.4	3,824	7.6	6.1	4,000	7.9	6.4	4,677	9.3	7.5
Wilmington, N.C.	3,601	7.1	5.8	3,758	7.4	6.0	3,567	7.1	5.7	4,021	8.0	6.4	4,197	8.3	6.8	4,874	9.7	7.8
Charleston, S.C.	3,672	7.3	5.9	3,829	7.6	6.1	3,638	7.2	5.8	4,092	8.1	6.6	4,268	8.5	6.8	4,945	9.8	7.9
New Orleans, La.	4,663	9.2	7.5	4,820	9.6	7.7	4,629	9.2	7.4	5,083	10.0	8.1	5,259	10.4	8.4	5,936	11.8	9.5
Jacksonville, Fla.	3,822	7.6	6.1	4,276	8.5	6.8	4,085	8.1	6.5	4,539	9.0	7.3	4,715	9.4	7.6	5,392	10.7	8.6
Tampa, Fla.	4,371	8.7	7.0	4,528	9.0	7.2	4,337	8.6	7.0	4,791	9.5	7.7	4,967	9.8	8.0	5,644	11.2	9.0
Houston, Tex.	4,870	9.6	7.8	5,037	10.0	8.1	4,846	9.6	7.8	5,300	10.5	8.5	5,476	10.9	8.8	6,153	12.2	9.9
Galveston, Tex.	4,837	9.6	7.8	4,994	9.9	8.0	4,803	9.5	7.7	5,257	10.4	8.4	5,433	10.8	8.7	6,111	12.1	9.8
San Diego, Calif.	7,484	14.9	12.6	7,641	15.2	12.2	7,450	14.8	11.9	7,904	15.7	12.7	8,080	16.0	12.9	8,757	17.4	14.0
Los Angeles, Calif.	7,554	15.0	12.1	7,711	15.3	12.4	7,520	14.9	7.2	7,974	15.8	12.8	8,150	16.2	13.1	8,827	17.5	14.1
San Francisco, Calif.	7,886	15.6	12.6	8,043	16.0	12.9	7,852	15.6	12.6	8,306	16.5	13.3	8,482	16.8	13.6	9,159	18.2	14.7
Seattle, Wash.	8,661	17.2	13.9	8,818	17.5	14.1	8,627	17.1	13.8	9,081	18.0	14.6	9,257	18.4	14.8	9,934	19.7	15.9

1/ Source: Distances Between Ports Pub. No. 151, U.S. Naval Oceanographic Office, Washington, D.C., 1964. United States-Track C used for Atlantic Ocean distances. The deepwater track used for Baltic Sea distances.

80-to-96-hour service between the same points. A reasonable estimate of the transit time required for shipments embarked at U. S. Atlantic ports can, therefore, be obtained by adding 3. 3 days (truck) and 10 days (rail) to the voyage times from New York shown in table 18. No rail shipments were reported to New Orleans or other Gulf ports. Truck shipments from the Pacific Northwest to New Orleans were reported to require 48 hours transit time.

Table 19 shows the transit time required for shipments made, assuming 3. 3-day truck and 10. 0-day rail service combined with 21-knot vessel service via New York, compared with 21-knot vessel service from Los Angeles. The longest transit time shown (19. 0 days) would exhaust a 14-day marketable life and leave no more than 2 of 21 days of marketable life for lettuce. The shortest transit time shown would leave at least 4. 3 days of marketable life. The relatively short transit time required by the New York route doubtless plays a part in the relatively large volume of lettuce shown moving to Europe through that port.

Equipment and Facility Inventory

The quantity of suitable equipment available is a factor, but by no means the sole factor, in determining the quantity of transportation service

Table 19.--Transit times in days required for shipments from California to Europe, selected routes, vessel speed 21 knots

Destination	Via Los Angeles, Calif.	Via New York, N.Y.		Via New Orleans, La., including truck time (2 days)
		Including truck time (3.3 days)	Including rail time (10.0 days)	
	Days			
Liverpool, England ...	15.0	9.7	16.4	11.2
Rotterdam, Neth.	15.3	10.1	16.8	11.6
Le Havre, France	14.9	9.7	16.4	11.2
Hamburg, W. Germany ..	15.8	10.6	17.3	12.0
Goteborg, Sweden	16.2	10.9	17.6	12.4
Stockholm, Sweden	17.5	12.3	19.0	13.8

available. The quantity of service available is a factor in determining the prices shippers pay for transportation services. For these reasons it is useful to examine the inventory of transportation equipment suitable for carrying fresh fruits and vegetables.

Refrigerator Car Inventory

Two types of railcars are used for hauling commodities requiring refrigeration in transit. So-called nonmechanical cars obtain their cooling from water ice. Mechanical cars are cooled by self-contained refrigeration units powered by internal combustion engines.

Ownership of refrigerator cars by railroads has declined in recent years, but private ownership has increased so that the total refrigerator car capacity has substantially risen.

Several trends can be seen for railroad-owned refrigerated cars. Between 1968 and 1970 the total number and capacity of nonmechanical cars declined to 7,086 cars (34 percent) and 328,507 tons (32.6 percent) (table 20). As average per car capacity increased about 1 ton in this period, it appears that smaller, older cars are being retired from service. If this trend continues, as seems likely, few nonmechanical cars will be in service by 1975.

Mechanical refrigerator cars also show declining trends (table 20). In 1968-70 the number of these cars decreased 8.4 percent to 4,468, and total capacity decreased 3.7 percent to 291,144 tons. Average capacity increased from 62 to 65.2 tons in these years. Knowledgeable persons in the field indicate that these trends are the result of removing certain old, relatively small cars from service and adding larger cars to the fleet. The increase in both number and capacity in 1969 indicates that substantial additions took place during 1968-69, while the 1969-70 decrease in number and capacity shows substantial retirements in these years.

Refrigerator cars are owned by other firms as well as railroads. The Interstate Commerce Commission reports capacity data for only one such category: Firms which own 1,000 cars or more and which are not owned or controlled by railroads. As nonrailroad owners account for more than 80 percent of all refrigerator cars, it was deemed useful to estimate the aggregate capacity of privately-owned cars. This estimate was made by assuming that all nonrailroad-owned cars were of the average size shown in table 21 for cars owned by nonrailroad owned or controlled firms owning 1,000 or more cars. These estimates result in capacity distributions approximately equal to the distributions of numbers of cars (table 22).

Car companies owned or controlled by railroads accounted for 61 to 63 percent of all refrigerator cars and an estimated 58 to 64 percent of refrigerator car capacity in 1968-70 (table 22). While the number of cars owned by such companies declined from 46,657 in 1968 to 41,867 in 1970, aggregate capacity increased 27 percent to 2.4 million tons in 1970.

Table 20.--Railroad-owned refrigerator cars, number and capacity, 1968-70 1/

Year	Mechanical refrigeration			Nonmechanical refrigeration			Total			Mechanical cars as percent of total	
	Cars	Capacity	Average capacity	Cars	Capacity	Average capacity	Cars	Capacity	Average capacity	Cars	Capacity
	No.	Tons	Tons	No.	Tons	Tons	No.	Tons	Tons	Pct.	Pct.
1968	4,877	302,295	62.0	10,761	486,451	45.2	15,638	788,746	50.4	31.2	38.3
1969	5,295	338,261	63.9	9,804	450,685	46.0	15,099	788,946	52.2	35.1	42.9
1970	4,468	291,144	65.2	7,086	328,507	46.4	11,554	619,651	53.6	38.7	47.0
Pct. change 1968-70	-8.4	-3.7	+5.2	-34.2	-32.6	+2.6	-26.1	-21.4	+6.3		

1/ Statistics of Railroads of Class I in the United States, Association of American Railroads, American Railroads Bldg., Washington, D.C., Sept. 1971.

Table 21.--Privately-owned refrigerator cars, number and capacity, 1968-70 1/

Year	Car companies owned or controlled by railroads			Other owners of 1,000 or more cars			Other owners of less than 1,000 cars		
	Cars	Capacity 2/	Average capacity 2/	Cars	Capacity	Average capacity 2/	Cars	Capacity 2/	Average capacity 2/
	No.	Tons	Tons	No.	Tons	Tons	No.	Tons	Tons
1968	46,657	1,856,949	39.8	11,384	453,556	39.8	2,029	80,754	39.8
1969	44,515	2,386,004	53.6	11,830	634,165	53.6	1,918	102,805	53.6
1970	41,867	2,352,925	56.2	11,101	623,915	56.2	1,930	108,466	56.2
Pct. change 1968-70	-10.3	+26.7	+41.2	-2.5	+37.6	+41.2	-4.9	+34.3	41.2

1/ Source: Transport Statistics in the United States, Part 9, Private Car Lines, Bureau of Accounts, Interstate Commerce Commission, Wash., D.C., Issues of 1968-70.

2/ Estimated at average capacity of cars owned by owners of 1,000 or more cars.

Table 22.--Ownership distribution of refrigerator cars, 1968-70

Year	Railroad owned: Cars	Railroad owned: Capacity	Railroad controlled: Cars	Railroad controlled: Capacity1/
	------------	Pct.	------------	
1968	20.6	24.8	61.6	58.4
1969	20.6	20.2	60.7	61.0
1970	17.4	16.7	63.0	63.5
Pct. change 1968-70	--	--	--	--

Year	Other ownership: Cars	Other ownership: Capacity1/	Total: Cars	Total: Capacity
	--- Pct.	---	No.	Tons
1968	17.7	16.8	75,708	3,180,005
1969	18.7	16.3	73,362	3,911,920
1970	19.6	19.8	66,452	3,704,957
Pct. change 1968-70	--	--	-12.2	+16.5

1/ Estimated at average capacity of cars owned by owners of 1,000 or more cars.

Cars owned by nonrailroad owned or controlled firms owning more than 1,000 cars showed similar trends. Ownership by these firms decreased 2.5 percent to 11,000 cars in 1970 while aggregate capacity increased 37.6 percent to 623,915 tons (table 21).

There also appears to be a tendency for ownership to shift from railroads to private car companies. As the nonmechanical cars are retired due to obsolescence, this shift may become more pronounced.

Refrigerated Truck Inventory

Current estimates of the number of refrigerated trucks in the United States are not available. The Census of Transportation for 1967 indicates that approximately 164,000 insulated refrigerated trucks, a 6.5 percent increase from 1963, were in use during 1967 (table 23). It appears that the average size of refrigerated trucks also increased during the same period. In 1963, 11 percent of the refrigerated trucks were 35 or more feet in length. By 1967, nearly 17 percent were found to be longer than 35 feet. These larger vehicles are most suitable for long-distance hauls. It appears that the supply of refrigerated trucks tended to increase through the 1960's. This trend has probably continued into the 1970's.

Table 23.--Distribution of insulated refrigerated vans by length, 1963 and 1967 1/

Length in feet	1963 Vans	1963 Percent of total	Length in feet	1967 Vans	1967 Percent of total
	Thous.	Pct.		Thous.	Pct.
Less than 10	24	15.6	Less than 10	26	16.2
10-15.9	74	47.8	10-12	36	22.1
16-24.9	13	8.5	13-15	34	20.9
25-34.9	17	10.9	16-19	15	9.4
35 and more	20	12.9	20-27	4	2.7
			28-35	9	5.6
Unreported	7	4.3	36-40	25	15.5
			41 and more	2	1.4
Total	154	100.0			
			Unreported	10	6.2
			Total	164	100.0

1/ Census of Transportation Truck Inventory and Use Survey, Bureau of the Census, U.S. Department of Commerce, 1963 and 1967.

Oceangoing Ship Inventory

Conventional vessels. In 1970, a total of 937 refrigerated vessels averaging 5,600 deadweight tons were available worldwide (table 24). 15/ Of these only 32 were U.S. registry. U.S. vessels, however, tended to be slightly larger, averaging 6,100 deadweight tons.

Between 1967 and 1970 the number and total capacity of U.S.-flag refrigerated vessels declined 33 and 31 percent respectively. Foreign-flag refrigerated vessels increased their number and total capacity by 28 and 23 percent, to 937 vessels and 5.2 million deadweight tons.

Other freighters show similar trends. U.S.-flag nonrefrigerated freighters declined 30 percent, from 1,742 to 1,215 vessels. Total capacity of these ships decreased from 17.4 to 12.6 million deadweight tons (28 percent) although average capacity increased about 4 percent to 10,400 deadweight tons. Foreign-flag freighters showed modest increases in the same period. In 1970 a total of 11,857 of the freighters offered a total capacity of 91.5 million deadweight tons.

Considering the relatively small number and carrying capacity of U.S.-flag refrigerated ships, it seems likely that exporters of refrigerated cargoes often turn to foreign-flag vessels for service.

Container vessels. There were several problems in attempting to develop an inventory of container vessels. With the exception of tankers, most ocean vessels can carry at least some containers in their holds or as deck cargo. The majority of all vessels, therefore, have some potential for containerized transport. To further complicate the issue, relatively few completely containerized vessels exist. Many vessels possessing racks to hold containers also have conventional holds, refrigerated cargo space, and tanks suitable for bulk liquids. The vessels represented in table 25 are also found under one of the headings in table 24.

In general the sources available were not suitable to determine the exact number of ships in a given service. Ships shown as participating in the United States-Europe service represent ownership by those steamship lines which offer some service between the United States and Europe. With few exceptions, ocean vessels are not restricted as to the routes they ply and their owners take full advantage of this freedom.

U.S.-flag vessels account for 34 percent of all container ships, 42 percent of all container positions offered, and 75 percent of the refrigerated container positions available. The 121 U.S.-flag vessels available for United States-Europe service, in contrast to 55 foreign-flag vessels, appear to indicate U.S. dominance in this service. A significant portion of foreign-

15/ Deadweight ton: A measure of a vessel's carrying capacity in long tons (2,200 lb.).

Table 24.--Merchant freighters at year end, number and capacity, 1967-70 1/

Year	Registry	Refrigerated vessels: Number	Refrigerated vessels: Capacity	Refrigerated vessels: Average capacity	Other freighters: Number	Other freighters: Capacity
			1,000 long tons	Long tons		1,000 long tons
1967	U.S. flag	48	284	5,917	1,742	17,461
	Foreign flag	707	4,124	5,892	10,195	73,357
	World total	755	4,405	5,834	11,937	90,818
1968	U.S. flag	47	352	7,489	1,659	16,740
	Foreign flag	811	4,583	5,651	10,340	74,474
	World total	858	4,935	5,752	11,999	91,214
1969	U.S. flag	43	267	6,209	1,541	15,758
	Foreign flag	833	4,687	5,627	10,334	75,752
	World total	876	4,954	5,655	11,875	91,510
1970	U.S. flag	32	196	6,125	1,215	12,644
	Foreign flag	905	5,057	5,588	10,642	78,854
	World total	937	5,253	5,606	11,857	91,498
Pct. change 1967-70 ...	U.S. flag	-33.3	-31.0	+3.5	-30.2	-27.6
	Foreign flag	+28.0	+22.7	-5.2	+4.4	+7.5
	World total	+24.1	+19.2	-3.9	-0.7	+0.7

1/ Source: Merchant Fleets of the World, Oceangoing Steam and Motor Ships of 1,000 Gross Tons and Over, Maritime Administration, U.S. Dept. Commerce, issues of 1968-70.

controlled container shipping is employed in the Baltic or coastal trades. Such vessels are unlikely to be available for United States-to-Europe service.

In contrast to break-bulk vessels, U.S. shippers of perishable commodities would appear able to readily obtain service from U.S.-flag container ships.

Table 25.--Number of container ships and standardized (20 ft.) container positions available 1/

Service	U.S.-flag vessels			
	Ships	Container positions	Refrigerated container positions	Average number of container positions
United States-Europe	121	66,148	---	547
Other	68	29,806	3,003	438
Total	189	95,954	3,003	508

Service	Foreign-flag vessels				Totals	
	Ships	Container positions	Refrigerated container positions	Average number of container positions	Ships	Container positions
United States-Europe	55	34,777	500	623	176	100,925
Other	308	95,022	522	308	376	124,828
Total	363	129,799	1,022	358	552	225,753

1/ Source: Jane's Freight Containers 1971-72, Jane's Yearbooks, Paulton House, Shepherdess Walk, London NI, England.

Inventory of Selected U.S. Port Facilities

An inventory of port facilities was taken to examine 15 selected ports' ability to handle fresh fruits and vegetables. Each port selected met at least one of the following criteria: ability to handle containers, or existence of cold storage facilities, or presence of substantial flows of fresh fruits and vegetables. The inventory included transportation service available and level of activity, break-bulk facilities, and container facilities.

Transportation service available and level of activity. Rail lines serving the selected ports numbered from one to 20, steamship lines numbered from 20 to 185, and certificated interstate motor carriers varied from 14 to 1,500 (table 26). Average yearly tonnage (excluding bulk) handled at each of the selected ports in 1968-70 ranged from 1.2 to 32.7 million tons.

Of the selected ports, New York handled the largest average yearly tonnage (32.7 million tons) and had the greatest number of rail (20) and steamship lines (185) serving its port area. However, it ranked fifth in number of interstate motor carriers. San Diego, on the other hand, handled the lowest average yearly tonnage (1.2 million tons) and had the fewest steamship lines (20). San Diego also had next to the smallest number of railroad lines and interstate motor carriers serving its port area.

Generally speaking, average yearly tonnage for each port was found to increase as number of rail lines and steamship lines increased.

Break-bulk facilities. Actual and potential cold storage capacity for all selected ports varied from 0.1 (Galveston) to 27.6 (New York) million cubic feet (table 27). Cold storage capacity included cooler as well as freezer capacity, since it was assumed that freezer capacity could be converted into suitable fresh fruit and vegetable storage.

Break-bulk pier space ranged from 0.1 (Portland, Oreg.) to 16.2 (New York) million square feet and from 1,300 to 200,000 lineal feet.

Port cranes numbered from 0 (Los Angeles) to 60 (New York) with individual lift capacities varying from 1 to 500 tons. The ports of Los Angeles and Long Beach did not own any cranes, but reported that they were available from stevedore companies. In some cases it was reported that ships used their own tackle to work cargo.

Container facilities. Container pier space ranged from 0.1 (Boston and Portland) to 4.5 (San Francisco-Oakland) million square feet and from 1,300 (Portland) to 30,000 (New York) lineal feet among the selected ports (table 28). Container piers usually had less width than the break-bulk piers, but the former piers were frequently backed up with paved yard space not available at break-bulk piers.

Container yard area varied from 0.0 (New Orleans and San Diego) to 52.3 (New York) million square feet, while container cranes numbered from 0 to

Table 26.--Inventory of transportation service available and level of activity at selected U.S. ports, 1971 1/

Ports	Rail lines	Steamship lines	Interstate motor carriers	Average yearly tonnage 1968-70 2/
				Billion tons
Boston, Mass.	5	86	3/1,500	2.0
New York, N.Y.	20	185	500	32.7
Philadelphia, Pa.	5	110	250	5.1
Baltimore, Md.	5	70	150	7.0
Norfolk and Hampton Roads, Va.	8	90	134	2.0
Jacksonville, Fla.	3	38	3/20	2.4
Tampa, Fla.	1	3/100	21	4.0
New Orleans, La.	9	90	21	15.7
Galveston, Tex.	8	3/80	14	2.7
Houston, Tex.	9	120	35	14.3
San Diego, Calif.	2	20	20	1.2
Los Angeles and Long Beach, Calif.	6	70	1,100	10.1
San Francisco and Oakland, Calif.	6	60	1,000	4.9
Portland, Oreg.	4	52	3/1,500	2.8
Seattle and Tacoma, Wash.	4	90	20	4.6

1/ Data obtained from port literature and Department of the Army Corps of Engineers.
2/ Excludes bulk cargo.
3/ Slightly greater than number shown.

Table 27.--Inventory of break-bulk facilities at selected U.S. ports, 1971 1/

Ports	Cold storage capacity cubic feet 2/	Pier space: Square feet	Pier space: Lineal feet	Port cranes: Number	Port cranes: Lift capacity
	Millions	Millions	Thousands		Tons
Boston, Mass.	12.4	2.5	13.2	2	28
New York, N.Y.	27.6	16.2	200.0	3/60	5-500
Philadelphia, Pa.	9.2	4.8	48.3	36	5-150
Baltimore, Md.	4.6	4.6	38.1	31	5-75
Norfolk and Hampton Roads, Va.	7.2	1.7	10.6	11	1-110
Jacksonville, Fla.	3.0	4/.5	8.6	4	20-30
Tampa, Fla.	3.7	4/.1	7.5	13	20-72
New Orleans, La.	4.1	5/10.8	6/53.8	34	10-600
Galveston, Tex.	.1	1.9	14.4	6	30-75
Houston, Tex.	7/2.3	2.5	15.8	14	8-20
San Diego, Calif.	1.7	8/4.3	8/14.5	8/2	50
Los Angeles and Long Beach, Calif.	1.5	3.4	57.0	9/--	---
San Francisco and Oakland, Calif.	8.7	10/4.7	38.9	8	30-140
Portland, Oreg.	.1	8/.1	8/1.3	8/2	40-50
Seattle and Tacoma, Wash.	16.6	1.6	33.5	22	25-500

1/ Data obtained from port literature and conversations with port personnel.
2/ Includes actual and potential cold storage capacity.
3/ Sixty cranes afloat and an indeterminate number of mobile land cranes.
4/ All berths are marginal.
5/ Includes 3.9 million square feet used for break-bulk or container cargo.
6/ Includes 14,584 lineal feet for break-bulk or container cargo.
7/ Figures are from 1959 data, more recent data not available.
8/ These facilities are used for break-bulk or container cargo.
9/ Ships' tackle used and stevedore company cranes available.
10/ Includes 4.0 million square feet used for break-bulk or container cargo.

Table 28.--Inventory of container facilities at selected U.S. ports, 1971 1/

Ports	Pier space: Square feet	Pier space: Lineal feet	Yard area, square feet	Port cranes: Number	Port cranes: Lift capacity
	Millions	Thousands	Millions		Tons
Boston, Mass.	2/.1	2.8	1.6	3	28-50
New York, N.Y.	3.0	30.0	52.3	30	35-40
Philadelphia, Pa. ..	3/.3	12.3	7.4	2	45
Baltimore, Md.	.5	2.4	5.7	15	28-75
Norfolk and Hampton Roads, Va.	.5	4.2	2.0	6	35-50
Jacksonville, Fla. .	2/.4	4.6	1.0	2	28-45
Tampa, Fla.	2/.4	4/5.2	4/.5	8	3/25-72
New Orleans, La. ...	4/3.9	4/14.6	--	--	--
Galveston, Tex.	1.0	4.2	1.9	2	50-60
Houston, Tex.	1.0	4.2	2.1	2	28-40
San Diego, Calif. ..	4/4.3	4/14.5	--	4/2	4/50
Los Angeles and Long Beach, Calif.	.7	10.5	.2	5	25-47
San Francisco and Oakland, Calif.	5/4.5	17.5	9.5	17	24-30
Portland, Oreg.	4/.1	4/1.3	4/.9	4/2	4/40-50
Seattle and Tacoma, Wash.	.5	5.8	3.4	4	28

1/ Data obtained from port literature, conversations with port personnel, and Jane's Freight Container, 1971-72.
2/ All berthing is marginal.
3/ Most berths are marginal.
4/ Facilities used for break-bulk or container cargo.
5/ Includes 4.0 million square feet used for break-bulk or container cargo.

30 with individual lift capacities ranging from 25 to 75 tons. Ports without yard area or container cranes were in the process of constructing or acquiring them.

Expansion plans of selected ports. 16/ All of the selected ports have some form of building plans scheduled for the next few years. Many ports have placed an emphasis on developing container facilities or have recently completed them.

Port Ranking

From the data in tables 26-28, it would appear that most of the selected ports could handle exports of fresh fruits and vegetables. However, much produce grown in the Western United States and designated for export shipment is shipped through the port of New York. Currently many shippers complain about undesirable conditions there but continue to use its facilities. Their precise rationale for continued use could not be determined from available information. Since other ports appear to have facilities capable of handling produce exports, one might wonder what factors determine the use of one port over another. One hypothesis suggested is that fresh fruit and vegetable export tonnage is a function of the quantity of transportation service and physical facilities found at a given port. An effort was made to rank ports based on the quantity of transportation and handling facilities available. The following factors were found to be significantly related to the tonnage (excluding bulk cargo) moving through a port: (1) number of rail lines serving the port, (2) number of steamship lines serving the port, (3) lineal feet of pier space for break-bulk and container piers, (4) cold storage capacity, (5) yard area, and (6) number of break-bulk and container cranes.

As these factors tend to be significantly intercorrelated, it was impossible to rank ports in order of their quality.

Transportation Costs

Ocean Rates

Of the many forms of ocean transportation available to exporters of fresh fruits and vegetables, only three--conference service, charter service, container service--were reported to be used by the shippers surveyed. For this reason, prices were obtained for only a few of the many possible forms and levels of service. Prices are for the 1971-72 season.

16/ Data obtained from port literature and from Marine Engineering Log, 30th Annual Maritime Review and Yearbook Issue, U. S. and World Ports, Vol. LXXVI, No. 7 (June 15, 1971), pp. 125-128, 180-189.

Fresh grapes were reported to move only in bulk by conference vessels. Shipments from the West Coast to the United Kingdom and Sweden commanded rates of 4.2 and 4.3 cents per pound respectively.

Citrus shipments from the West Coast to Europe in chartered vessels commanded a rate of 8.8 cents per pound. Those from New York and Houston to Europe in container vessels required 4.6 and 6.8 cents per pound respectively.

Apples shipped in bulk were reported to require 4.4 cents per pound from either New York or New Orleans to Europe. Shipments made in containerized vessels from Portland, Oreg., to the United Kingdom and Scandinavia commanded rates of 4.7 and 5.0 cents per pound respectively.

Containerized shipments of lettuce from New York and Norfolk averaged 6.5 cents per pound.

The extent to which the rates charged by ocean vessels are regulated is beyond the scope of this discussion. It is fair to state, however, that no economic regulation exists for chartered vessels and the rates charged by conference vessels are regulated to a lesser extent than domestic rail rates. Conceptually all ocean rates could be expected to show less stability over time than domestic rail rates. Experience with charter rates for grain cargoes indicates that these prices are subject to severe fluctuations. 17/

Truck Rates

Shippers were queried as to the truck charges normally paid in connection with export shipments. Due to the limited number of shippers contacted and the few routes utilized by the sample group for export movements, the replies received were mostly inadequate to evaluate optional routes. It was therefore necessary to estimate truck rates by other means.

A schedule of suggested truck rates was obtained from the Texas Citrus and Vegetable Growers and Shippers Association. This schedule was developed in consultation among Association members, truckers, and truck brokers, and is believed to represent the usual level of charges made for truck service from the Rio Grande Valley to the points listed in the schedule.

Standard highway mileage from McAllen, Tex., to each point shown in the schedule was determined. Standard regression techniques were utilized to compare these distances with the rates shown for fresh grapefruit and oranges, and fresh lettuce. Values obtained from the regression analysis are shown below.

17/ Hutchinson, T.Q., Heavy Grain Exports in Voyage-Chartered Ships, Rates and Volume, U.S. Dept. Agr., Mktg. Res. Rep. 812, Jan. 1968.

	Grapefruit & oranges	Lettuce
Coefficient of correlation (r)	0.899	0.888
Coefficient of determination (r^2)	0.809	0.788
"t" value	23.287	21.542
a value	15.40265 ¢/bx/mi.	8.87712 ¢/bx/mi.
b value	0.05821 ¢/bx/mi.	0.04358 ¢/bx/mi.
Standard error of b	0.002	0.002

With the 129 degrees of freedom available in the analysis, a "t" value greater than 2.62 is required to accept the estimated rates at the 99 percent level. That is, this t value indicates that there is less than a 1 percent chance that the positive relationship observed between rate and distance in this sample is due to chance alone.

The coefficients of determination indicate that about 81 percent of the differences in rates for grapefruit and oranges, and 79 percent of the differences in rates for lettuce are accounted for by differences in mileage. It thus appears reasonable to estimate truck rates using the general equation Y = a + bX where:

Y = Estimated rate
X = Distance between points
a = 15.40265 ¢/bx/mi. (grapefruit and oranges)
8.87712 ¢/bx/mi. (lettuce)
b = 0.05821 ¢/bx/mi. (grapefruit and oranges)
0.04358 ¢/bx/mi. (lettuce)

A question exists as to the applicability of these rates to origins outside the Rio Grande Valley. Exempt for-hire motor carriers are not restricted with regard to areas they serve. It seems reasonable to assume that they participate in a national rather than a regional market. Unless their costs of operation vary regionally, which seems unlikely, it seems reasonable to believe that their prices (rates) are relatively uniform for hauls of similar length. The estimates of rates based on shipments between Texas and other U.S. points are applied to other shipments of similar commodities over similar distances.

The estimation procedure described above was used to derive the truck charges used in computing minimum cost reduction. While no rates were obtained for fresh lemons specifically, it seems reasonable to believe that the rates for grapefruit and oranges are also applicable to lemons. Lemons are similar in transport requirements to other citrus and possess similar density.

No means of estimating truck charges for apples or fresh grapes were available. Only reported rate data for apples and grapes were, therefore, used in the section dealing with shipping costs.

Rail Rates

Under U.S. law railroads must publish rates for interstate shipments of all commodities. A rail rate, therefore, exists for all the commodities considered in this study from any rail terminal in the Western United States to all U.S. seaports. In addition to the rates required by law, railroads commonly quote other rates, termed "commodity rates." In general these rates represent the prices usually paid for rail service. Frequently more than a single "commodity rate" is available for service between two points involved in regular shipments of a given commodity. "Commodity rates" tend to vary with size and routing of the shipment in question.

To reduce the burden of data collection and evaluation implicit in the above, the number of geographic points considered in this study was sharply limited. Points which in 1970 accounted for 10 percent or more of the shipments of each commodity considered from Western origins were selected (table 29). In addition, certain other origins were chosen to add geographic representation.

To select embarcation ports, the volumes of exports for all U.S. ports showing any exports of fresh or frozen fruits or vegetables between 1968 and 1970 were arrayed (table 30). Those ports showing a significant volume of trade were selected for consideration in the study. In the cases of Seattle-Tacoma and San Francisco-Oakland, only one of each pair was selected for specific consideration. Each pair of ports uses the same body of water and may be considered as a single port.

Routes considered in the study were also restricted. Rail rates were obtained only for interstate shipments. The rail rates themselves were the lowest rates available on December 1, 1971, and were obtained from Transportation and Warehousing Division, Agricultural Stabilization and Conservation Service, USDA. In addition to the rail rates, charges for ancillary services required to complete a shipment of fresh produce were also obtained. These charges which are significant factors in the total cost of a rail shipment, showed much less uniformity among routes than the rail rates themselves.

Least-Cost Routings

This section shows the routes, modes, and associated costs which make up the least-cost routing from the origins shown for each commodity to Western Europe. Since both the truck and ocean charges used in the computations are subject to short-run variation, it is possible that routings other than those shown could result in lower charges for a particular shipper at a particular time.

Table 29.--Market share of selected commodities for selected shipping points 1/

Shipping point	Grapefruit 2/	Lettuce 2/	Oranges 3/	Lemons 3/	Grapes 3/	Apples 4/
	------	------	------	Percent	------	------
Arizona:						
Phoenix	16	4	--	--	1	--
Tucson	--	8	--	--	--	--
California:						
Indio	10	--	--	--	--	--
San Bernardino	16	--	--	--	--	--
El Centro	--	8	--	--	--	--
Salinas	--	28	--	--	--	--
Fresno	--	--	22	5/	26	--
Exeter	--	--	11	--	--	--
Bakersfield	--	--	6	--	23	--
Oxnard	--	--	--	30	--	--
Santa Paula	--	--	--	11	--	--
Delano	--	--	--	14	--	--
New Mexico:						
Las Cruces	5/	5/	--	--	--	--
Texas:						
McAllen	2	5/	--	--	--	--
Washington:						
Wenatchee	--	--	--	--	--	12
Yakima	--	--	--	--	--	35
Oregon:						
Hood River	--	--	--	--	--	3
Total	44	48	39	55	50	50

1/ Source: Fresh Fruit and Vegetable Shipments C&MS-13 (1970), Consumer and Marketing Service, USDA; Washington, D.C., June 1971.
2/ Based on Arizona, California, New Mexico and Texas shipments.
3/ Based on California and Arizona shipments.
4/ Based on Washington and Oregon shipments.
5/ Less than 0.5 percent.

Table 30.--Exports of fresh fruits and tree nuts, and fresh and frozen vegetables from selected U.S. ports, 1968-70 1/

Port	Commodity group	1968 Percent of total	1968 Quantity	1969 Percent of total	1969 Quantity	1970 Percent of total	1970 Quantity
		Pct.	Tons	Pct.	Tons	Pct.	Tons
Boston, Mass.	Fresh fruit & tree nuts		2,097		206		981
	Fresh & frozen vege.		235		383		125
Total		1.1	2,332	0.2	589	0.4	1,106
New York, N.Y.	Fresh fruit & tree nuts		27,497		22,319		16,567
	Fresh & frozen vege.		22,300		28,512		29,783
Total		24.1	49,797	21.5	50,831	17.2	46,350
Philadelphia, Pa.	Fresh fruit & tree nuts		4		21		140
	Fresh & frozen vege.		78		75		511
Total		0.0	82	0.0	96	0.2	651
Baltimore, Md.	Fresh fruit & tree nuts		321		297		635
	Fresh & frozen vege.		1,653		475		2,867
Total		1.0	1,974	0.3	772	1.3	3,502
Norfolk, Va.	Fresh fruit & tree nuts		696		1,977		2,734
	Fresh & frozen vege.		475		789		2,854
Total		0.5	1,171	1.2	2,766	2.0	5,588
Charleston, S.C.	Fresh fruit & tree nuts		289		95		---
	Fresh & frozen vege.		---		---		---
Total		0.1	289	0.0	95	0.0	---
Savannah, Ga.	Fresh fruit & tree nuts		26		405		660
	Fresh & frozen vege.		109		---		---
Total		0.0	135	0.2	405	0.2	660
Jacksonville, Fla.	Fresh fruit & tree nuts		871		201		445
	Fresh & frozen vege.		450		109		247
Total		0.6	1,321	0.1	310	0.2	692
Brownsville, Tex.	Fresh fruit & tree nuts		4,457		10,527		4,963
	Fresh & frozen vege.		2,151		7,385		4,305
Total		3.2	6,608	7.6	17,912	3.3	8,998
Houston, Tex.	Fresh fruit & tree nuts		367		220		237
	Fresh & frozen vege.		571		600		1,979
Total		0.4	938	0.3	820	0.8	2,216
New Orleans, La.	Fresh fruit & tree nuts		2,180		2,410		1,929
	Fresh & frozen vege.		4,463		3,265		3,702
Total		3.2	6,643	2.4	5,675	2.1	5,631

See footnote at end of table.

Continued

Table 30.--Exports of fresh fruits and tree nuts, and fresh and frozen vegetables from selected U.S. ports, 1968-70 1/--Continued

Port	Commodity group	1968 Percent of total	1968 Quantity	1969 Percent of total	1969 Quantity	1970 Percent of total	1970 Quantity
		Pct.	Tons	Pct.	Tons	Pct.	Tons
Mobile, Ala.	Fresh fruit & tree nuts		---		51		---
	Fresh & frozen vege.		---		42		---
Total		0.0	---	0.0	93	0.0	---
Tampa, Fla.	Fresh fruit & tree nuts		1,202		3,507		1,894
	Fresh & frozen vege.		3,381		1,081		623
Total		2.2	4,583	1.9	4,538	0.9	2,517
Galveston, Tex.	Fresh fruit & tree nuts		---		4,097		437
	Fresh & frozen vege.		---		---		54
Total		0.0	---	1.7	4,097	0.2	491
San Diego, Calif.	Fresh fruit & tree nuts		1,164		406		90
	Fresh & frozen vege.		---		90		1
Total		0.5	1,164	0.2	496	0.0	91
Long Beach, Calif.	Fresh fruit & tree nuts		31,339		23,362		89,747
	Fresh & frozen vege.		56		21		60
Total		15.2	31,395	9.9	23,383	33.4	89,807
San Francisco, Calif.	Fresh fruit & tree nuts		54,853		73,660		51,042
	Fresh & frozen vege.		3,991		4,035		3,880
Total		28.5	58,884	32.9	77,695	20.4	54,922
Sacramento, Calif.	Fresh fruit & tree nuts		---		---		157
	Fresh & frozen vege.		---		---		---
Total		0.0	---	0.0	---	0.0	157
Stockton, Calif.	Fresh fruit & tree nuts		2,182		1,840		390
	Fresh & frozen vege.		40		328		142
Total		1.1	2,222	0.9	2,168	0.2	532
Portland, Oreg.	Fresh fruit & tree nuts		12,537		10,573		9,208
	Fresh & frozen vege.		2,533		2,383		7,432
Total		7.3	15,070	5.5	12,956	6.2	16,640
Tacoma, Wash.	Fresh fruit & tree nuts		778		1,817		1,916
	Fresh & frozen vege.		1,166		735		542
Total		0.9	1,944	1.1	2,552	0.9	2,458
Seattle, Wash.	Fresh fruit & tree nuts		7,828		13,738		7,459
	Fresh & frozen vege.		7,350		3,818		8,156
Total		7.4	15,178	7.4	17,556	5.8	15,615
Oakland, Calif.	Fresh fruit & tree nuts		3,282		6,344		7,832
	Fresh & frozen vege.		1,240		3,872		2,477
Total		2.2	4,522	4.3	10,216	3.8	10,309
Grand total		100.0	206,212	100.0	236,021	100.0	268,933

1/ Waterborne Commerce of the United States, Parts 1, 284, Board of Rivers and Harbors, U.S. Corps of Engineers, U.S. Dept. of the Army, issues of 1968-70.

Oranges

For all of the three origins shown, transportation costs are minimized by truck shipments to Los Angeles.

Grapefruit

Shipments of fresh grapefruit from Phoenix, Ariz., to Western Europe can be accomplished at lowest cost (7.7 cents per pound) by rail shipment via New York, Philadelphia, Baltimore, Norfolk, Va., or Jacksonville, Fla. The next lowest cost route available is either by truck via New York or by rail via Galveston, Tex. Shipments over either of these routes can be accomplished for approximately 9 cents per pound.

The lowest cost route for shipments originating in Indio or San Bernardino, Calif., is found in rail routing to any of the East Coast ports previously named. The associated cost, 7.7 cents per pound, compares favorably with 8.6 cents per pound by truck via Baltimore.

The data indicate that the low-cost routing for shipments originating at McAllen, Tex., is found in rail shipments via Jacksonville, at 6.4 cents per pound. Since this routing may be impractical, the next lowest routing is in truck shipments to Galveston, resulting in total charges of 7.67 cents per pound.

Although New York and Galveston have been shown to be the least-cost points of embarcation, substantial exports of fresh grapefruit are made through Los Angeles (see table 11).

Since the actual quantity of fresh grapefruit shipped from the points under study over any route is unknown, the savings available from use of the low-cost route can only be estimated. To make such an estimate several assumptions are required.

It seems reasonable to believe that shipments from McAllen already move over the low-cost route via Galveston. No savings would therefore be available.

If it is assumed that the other shipping points ship via Los Angeles for export and share the volume exported via Los Angeles in the same proportion as they share the total market, the following average movements to Los Angeles for export would result:

	Market Share	Shipments to Los Angeles (1,000 lb.)
Phoenix, Ariz.	16 pct.	1,426.9
Indio, Calif.	10 pct.	891.8
San Bernardino, Calif.	16 pct.	1,426.9
Total	42 pct.	3,745.6

Rate differences for shipments via New York, compared with Los Angeles, are as follows:

	Cents/lb.
Phoenix, Ariz.	2.05
Indio, Calif.	1.67
San Bernardino, Calif.	1.56

Applying these differences to the estimated export shipments to Los Angeles from each point results in savings of $66,404.

The above estimation procedure accounts for only 42 percent of the shipments made via Los Angeles. It does not seem likely that shipments from other points would move at a greater rate of savings. Assuming that savings occur at the same rate for all other points exporting through Los Angeles, the total savings available from diverting export shipments from Los Angeles to New York would be $158,105.

Lemons

The low-cost route for fresh lemons is found in shipping by rail via New York, Philadelphia, Baltimore, Norfolk or Jacksonville. The charges involved total 7.7 cents per pound. An average of 56.7 million pounds (83 percent) of U.S. lemon exports are shipped via Los Angeles (see table 12).

Exports of lemons via West Coast ports to Europe appear to require transportation charges of 9.2 to 9.4 cents per pound. Thus, savings of 1.5 to 1.7 cents per box appear available by diverting lemons from Los Angeles. Using the more conservative figure (1.5¢) would result in estimated savings averaging $850,620 per year. Again, it should be remembered that total costs of distribution not explicitly considered in this study, and benefits available from using a port relatively close to the production area, may reduce the actual net savings available from the figure shown above.

Apples

Data permitting estimation of truck rates for fresh apples to ports of embarcation not used by shippers participating the survey were not developed. Most of the rail-versus-truck comparisons made for other commodities in this study could not be made for apples.

Fresh apples shipped from Washington or Oregon appear to command a truck rate of less than 1/2 cent per pound to Seattle or Portland. Survey

respondents reported ocean rates to the Scandinavian countries to be approximately 5 cents per pound and the rate to the United Kingdom as slightly less, 4.7 cents per pound. The transportation cost for apples moving from the Pacific Northwest via ports in the same region to Western Europe would, therefore, be about 5.5 cents per pound. Shipments via rail to New Orleans or New York require 2.90 and 3.55 cents per pound respectively. Adding appropriate ocean charges of 4.4 cents per pound for either port results in total charges of 7.30 (New Orleans) and 7.95 (New York) cents per pound.

Substantial apple exports are shipped via New York and Boston (see table 13). It seems likely, however, that these exports chiefly represent eastern production. Therefore, savings available from more economic routings for western-produced apples are likely to be very small.

Grapes

No means of estimating truck rates for movements other than those reported by the survey respondents was developed. As no respondent reported shipping via any East or Gulf Coast port, no ocean rates were obtained for movements from these ports. It seems reasonable to believe, however, that grapes would require a rate at least as high as citrus. Rail rates for grapes tend to be equal to or above those for the citrus items considered in this study.

The reported total costs of exporting grapes to the United Kingdom and Sweden were 5.2 and 5.3 cents per pound respectively. These costs are composed of a truck rate of 1 cent per pound to San Francisco, and ocean rates of 4.2 and 4.3 cents. Given a rail rate of 3.26 cents to East Coast ports, an ocean rate below 2.04 cents would be required to divert grapes from their existing routing. Such a rate would be less than 50 percent of the prevailing rate for citrus and does not seem likely to be found. A similar situation is found for Gulf port routings.

On the average, the majority of all exports of fresh grapes move through the ports of New York (41 percent) and San Francisco (49 percent). It seems reasonable to believe that some savings could be realized for the volume exported through New York. Data adequate to quantify the savings were not developed.

Lettuce

Lettuce shippers reported exporting to Western Europe only via New York. Thus, no ocean rates were obtained for any other port. As shippers of other commodities generally reported ocean rates to apply to a range of ports on the same coast, and this practice is known to exist for other commodities, it seems reasonable to assume the rate reported from New

York would also apply to Baltimore, Philadelphia, Norfolk and Jacksonville.

Estimates of ocean rates for Gulf ports were obtained by converting the rate from New York to Europe to a nautical mile basis. The estimates were then applied to the distance from the Gulf ports considered to Liverpool, England.

Shipments of lettuce via West Coast ports were ruled out, as the transit time required is believed to preclude shipment to Western Europe through these ports.

Rail shipments from Phoenix or Tucson, Ariz., and El Centro, Calif., to all East or Gulf Coast destinations shown take the same rate. Since the estimating procedure for truck rates uses distance as the independent variable, truck charges vary slightly among origins. The least-cost routing for these three origins consists of truck movement to Jacksonville for embarcation. The combined truck-ocean charges vary from 8.6 (Tucson) to 8.9 cents per pound (El Centro).

As previously stated, shippers report that suitable vessels are seldom available at Jacksonville. This least-cost routing may, therefore, be unavailable in the real world.

The next least costly routing involves truck shipment to New York for export. This routing requires transportation charges varying from 9.1 (Tucson and Phoenix) to 9.3 cents per pound (El Centro).

Shipments from Salinas, Calif., also find their least-cost routing by truck through Jacksonville at 9.4 cents per pound. Since suitable vessel service may not be available, truck routing involves truck movement through Baltimore at 8.7 cents per pound. Charges for routing via Baltimore are only 0.1 cent per pound below those for New York.

New York and Baltimore account for about 82 percent, on the average, of all lettuce exports to Western Europe (table 14). It appears that no savings are available from more economical routings of fresh lettuce.

Summary

Three routes to Europe are available to Western growers of most commodities. Exports can be made via Atlantic Coast, Gulf Coast, or Pacific Coast ports. (Only lettuce is constrained from using Pacific Coast ports, by the transit time required.) Either rail or truck transportation can be utilized to reach a port from the packing location. Within this framework several noteworthy circumstances are found in the transportation pricing structure.

Rail rates tend to be equalized from all origins in a given growing area to he East Coast ports south of Boston. For example, oranges from Fresno,

Exeter, and Bakersfield, Calif., take a rate of 3.05 cents per pound to New York, Philadelphia, Baltimore, Norfolk, and Jacksonville (table 37). In similar fashion rail rates tend to be equalized to Houston and Galveston. Where such equalization exists, shippers are indifferent with regard to rail transportation costs among the equalized ports.

Although a least-cost routing can be calculated for each origin and commodity combination, the transportation cost differences are small. An error term is associated with the truck rates used in this analysis and the rates of exempt for-hire trucks are known to fluctuate somewhat during a shipping season. The rail rates used in this analysis are, in the short term, fixed by law. The ancillary charges, however, may vary with the size of the load. Thus, rail charges other than those used in this analysis may apply for a given shipment. Ocean rates also are known to fluctuate over time and the unit cost for commodities moving in a chartered vessel will vary with cargo size.

In view of the above it seems reasonable to believe that the cost of transportation is roughly equalized among routings. All else being equal, shippers should, therefore, be indifferent among routings. The existence of relatively well-defined shipping patterns suggests that all else is not equal. The transportation costs dealt with here are only a segment of the distribution cost. Further, the benefits available from a given set of distribution activities are not explicitly considered in a transportation cost formulation which only minimizes costs.

POTENTIALS FOR REDUCING TRANSPORTATION CHARGES

Reducing transportation charges could be expected to enhance the competitive position of fruit and vegetable producers in overseas markets. To examine potentials for such reduction it is convenient to divide transportation charges into two sectors, land and water. In both sectors rate reductions could be expected to take place either as a part of generalized price trends or as a result of efficiencies gained from technology.

Land Sector

As previously indicated, truck rates for fresh produce items are not published and no trend data are available. It seems reasonable to believe, however, that competitive forces will tend to hold truck rates not greatly different from rail rates. Such an assumption is consistent with the rail and truck rates obtained for this study. The behavior over time of rail rates, therefore, appears to be a reasonable proxy for the behavior of truck rates.

Table 31 shows that the railroad freight rate index computed by USDA for all agricultural commodities (1967 = 100) increased to 127 in 1967-71. In the same period the index of rates for fruits and vegetables increased to 134. It appears that the overall trend in rail rates is toward further increases.

Table 51.--Railroad freight rates: Index numbers for specified commodities, 1945-71 (1967=100)

Year	Live-stock	Meats	Fruits and vegetables	Wheat	All grains	Soy-beans	Cotton	Wool	Tobacco	Combined indexes 2/
1945	51	71	69	64	--	--	67	--	--	64
1946	53	70	70	65	--	--	67	--	--	65
1947	61	83	78	73	--	--	78	--	--	74
1948	72	101	90	88	--	--	88	--	--	86
1949	79	111	94	93	--	--	93	--	--	92
1950	80	113	96	95	--	--	95	--	--	94
1951	82	117	96	98	--	--	98	--	--	95
1952	89	125	101	105	--	--	106	--	--	102
1953	91	128	102	107	--	--	110	--	--	106
1954	91	128	102	107	--	--	110	--	--	106
1955	91	128	102	107	--	--	107	--	--	105
1956	96	133	105	113	--	--	103	--	--	109
1957	104	143	112	119	116	110	102	158	119	116
1958	108	132	109	122	120	116	103	161	111	115
1959	106	121	102	120	116	115	102	127	100	110
1960	105	121	100	119	115	115	101	122	99	109
1961	104	121	101	119	114	109	101	122	100	109
1962	102	120	100	116	113	107	101	107	100	108
1963	100	117	99	114	111	101	101	104	100	106
1964	99	113	99	111	108	100	100	100	100	105
1965	99	104	99	99	101	99	100	100	100	100
1966	99	100	99	99	100	99	100	100	99	99
1967	100	100	100	100	100	100	100	100	100	100
1968	104	103	103	101	100	101	100	101	102	101
1969	108	107	108	102	100	103	103	106	108	103
1970	119	117	118	113	109	114	113	119	118	114
1971	135	132	134	125	121	127	126	134	132	127

1/ All index number series are of the weighted aggregative type. They are based on averages of rates in effect during the year. Annual averages are computed by weighting the rates by the number of days they are in effect. In constructing the combined index, group indexes were weighted by average revenues for 1957-59. 2/ Beginning in 1957, the combined index includes soybeans, corn, small grains, wool, and tobacco, in addition to other products for which data are shown separately.

Unit Trains

In an article published in May 1973, one of the authors examined the feasibility of using unit trains for shipments of apples and lettuce from Western origins. 18/ A unit train operating between Salinas, Calif., and New York was found feasible. Such a train would offer potential annual savings of $133,613. It was found unlikely, however, that shippers of lettuce would enjoy cost reductions totaling this amount. Shippers would chiefly benefit from more rapid service and increased effective car supply.

Water Sector

It is convenient to divide the water sector into two areas, refrigerated vessels and container vessels.

Refrigerated Vessels

Refrigerated vessels may be available to shippers either as common carriers or as chartered ships. In the former case a rate is paid for services rendered. In the latter the voyage charter is analogous to a short-term lease. No information was obtained concerning trends in the rates charged by refrigerated ships. It is possible, however, to estimate the trend in rates for ships operating under voyage charters.

In 1970-71, voyage charter rates for heavy grain generally declined. 19/ While ships chartered to carry grain are seldom appropriate for perishable cargoes, it is possible that rates for refrigerated ships also declined during the same period. Such a conclusion is consistent with the increase in number and capacity of refrigerated ships shown in table 24. Worldwide demand for refrigerated vessels is not known. It does not appear reasonable to assume either that the decline in rates for refrigerated ships has been large or that it could be expected to continue indefinitely.

Container Ships

The trend in rates for container ships is also not known, but may be estimated. Container ships and their port facilities are both believed to substantially exceed the demand for container service. 20/ By the mid-1970's

18/ Hutchinson, T.Q., Feasibility of Unit Trains for Moving Apples and Lettuce from the West, "Marketing and Transportation Situation," MTS-189, U.S. Dept. Agr., May 1973, in which a unit train is defined as a set of cars operating in an unvarying configuration, shuttling continuously between fixed assembly and distribution points.

19/ Hutchinson, T.Q., The 18-Month Decline in Ocean Freight Rates Appears Near Ending, "FATUS," ERS, USDA, August 1972, pp. 37-38.

20/ The Impact of Containerization on the U.S. Economy Vol. II, Matson Research Co., San Francisco, Calif., Sept. 1970, pp. 3, 5-7.

container ship capacity is expected to exceed demand by one-third to one-half. 21/ As evidence that excess capacity exists, three shipping lines have reportedly formed a revenue-pooling cartel to avoid a rate war on the North Atlantic. 22/ Such cartels are intended to deny the benefits of excess capacity to shippers. Although it cannot be stated with certainty that the rates of container ships will decline, it is apparent that substantial pressures exist to maintain container ship rates at or below current levels.

At this point it is useful to compare the abilities of the container ship with the distribution needs of fresh fruits and vegetables.

Container ships offer speeds as high as 33 knots. Thus, transit times tend to be low relative to conventional vessels. In addition, time in port is substantially reduced.

Each van container is approximately truckload size. The container ships, therefore, can carry loads ranging from one to 1,000 truckloads. This flexibility seems to meet the needs of a distribution system requiring shipments varying in size from less than a truckload to 19 truckloads.

Since the climate within each van can be controlled and the van itself segregates each van load from its neighbors, the exact requirements for maintaining quality of fresh produce can be fulfilled.

Finally, the van container can be filled at a Western U.S. origin and transported to a European destination without further handling of the produce itself. Such distribution practice appears to offer savings in handling costs and transit time. Benefits in the form of improved delivered quality should stem from reduced transit time and number of handlings.

Three problem areas appear to exist. Table 25 shows that only 4,000 of 226,000 shipboard container positions available can be refrigerated. As the shippers interviewed reported difficulty in obtaining container service, it is possible that the demand for refrigerated container service already exceeds the supply. Even so, the cost of obtaining additional refrigerated container positions (installing increased electrical generation capacity and appropriate electrical circuits) is small relative to the cost of refrigerating existing holds.

It appears that a lack of interchange agreements among container ship lines is resulting in misallocation of the existing container supply. 23/ Such

21/ Developments and Problems of Seaborne Container Transport. 1970, Organization for Economic Co-operation and Development, 1971, page 16.

22/ Cooling the Rate War on the North Atlantic, "Business Week," McGraw-Hill Publication Co., New York, N.Y., April 29, 1972, pp. 48-52.

23/ Study of Container Interchange and Pooling Arrangements, Boozez Allen and Hamilton, Inc., for Dept. of Transportation, Washington, D.C., June 1970, pp. 45, 46, and 65.

misallocations reduce the effective supply of containers and result in uneconomic investments. Such investments, in turn, retard service growth or result in relatively high rates or both.

Finally, the lack of domestic interchange agreements previously discussed tends to deny shippers the benefits of efficient container service. The lack of transcontinental container service and rates is a particular barrier to increased container usage. 24/ 25/

Air Freight

Air freight is the newest entrant on the transportation scene. An air shipment from Los Angeles or San Francisco to Europe can be accomplished in less than 24 hours while any shipment utilizing ocean vessels will require several days. The cost, however, is quite high (tables 32 and 33). The cost of shipping fresh produce to Europe by some combinaton of land and ocean carrier rarely exceeds 12 cents per pound. Similar air shipments command more than 25 cents per pound.

It is possible that only produce of very high quality, commanding a commensurately high price, can be economically shipped by air. Table 34 shows that the average value of perishables shipped by air is about 6 cents per pound higher than those shipped by water. 26/ The above hypothesis appears to be true. This, in turn, implies that commodities shipped by air are destined for a specialty market such as hotels and restaurants serving relatively expensive meals. If this presumption is true, it seems unlikely that air freight will serve as a means for significant market expansion.

Nonetheless, air freight's potential to deliver high quality produce over long distances in a short time justifies a careful analysis of developing trends in this mode. It is possible that the additional marketable life and reduced product damage that appear available from the air mode would compensate for the high cost.

Exports

Data reflecting all U.S. exports for 1967 through 1970 were obtained from the U.S. Department of Commerce. These data consisted of the value and shipping weight of commodities shipped by vessel and by air from each of the 44 U.S. customs districts to each of the 165 (approximately) countries identified by the Department of Commerce's Schedule G, Classification of

24/ Ibid. pp. 51, 65, 78-79, 105.
25/ The Impact of Containerization on the U.S. Economy, Vol. II, Matson Research Co., San Francisco, Calif., Sept. 1970, page 12.
26/ Value is measured at the point of exportation. It is based on the selling price (or cost if not sold) and includes inland freight, insurance, and other charges to the port of exportation.

Table 32.--Charges for air shipment of fresh fruits and vegetables between selected points, 1969 1/

Origin and destination	Cost per pound
	Cents
From New York, N.Y., to:	
Antwerp, Belgium	18
Berlin, Germany	19
Dusseldorf, Germany	18
Gothenburg, Sweden	21
Paris, France	18
Rotterdam, Netherlands	18
London, England	17
From San Francisco, Calif., to New York, N.Y.	8.3
From Los Angeles, Calif., to New York, N.Y.	8.3

1/ International rates are taken from Clipper Cargo Tariff (C37), Pan American Airways, Domestic rates are taken from TWA Market Air Memo Tariff, Trans World Airways.

Table 33.--Charges for air shipment of fresh fruits and vegetables between California and selected overseas destinations, 1969 1/

Destination	Cost per pound
	Cents
Antwerp, Belgium	26.3
Berlin, Germany	27.3
Dusseldorf, Germany	26.3
Gothenburg, Sweden	29.3
Paris, France	26.3
Rotterdam, Netherlands	26.3
London, England	25.3

1/ International rates are taken from Clipper Cargo Tariff (C37), Pan American World Airways.

Table 34.--Average value of selected commodities exported by vessel and by air, 1970-71 1/

Commodities	1970			1971		
	Vessel	Air	Difference	Vessel	Air	Difference
	Dollars per pound					
Fresh grapes ...	0.127	0.209	+0.082	0.130	0.208	+0.078
Fresh apples ...	0.095	0.126	+0.031	0.103	0.158	+0.055
Fresh oranges ..	0.076	0.124	+0.048	0.084	0.101	+0.017
Other citrus ...	0.095	0.187	+0.092	0.098	0.185	+0.087
Average	--	--	0.063	--	--	0.059

1/ Based on U.S. Bureau of the Census, U.S. Exports-Schedule B Commodity Groupings, World, Area, Country and Method of Transportation, Report FT 450, 1970 and 1971 Annual.

Country Designations Used in Compiling the United States Foreign Trade Statistics.

Since these data comprised more than 4 million records, some rigorous screening was necessary. Those produce items which in 1967 accounted for an export volume by air of $1.0 million, or 1 million pounds, or both, were considered. These criteria resulted in a list of 24 commodities (table 35). To reduce the number of cells in the flow matrix for each commodity, both U.S. customs district and foreign destinations were grouped into the area classifications shown in tables 36 and 37. 27/

To further reduce the volume of data presented, only destination groupings receiving by air at least 100,000 pounds of the commodity under consideration were allowed to be entered in a flow matrix. Only the commodities considered by this study and fresh strawberries are discussed in this section (table 38).

As a result of the 100,000-pound constraint, the data shown in table 38 tend to under estimate the quantity of each commodity shipped by air in a given year. For example, the absence of shipments for lemons and grapefruit does not indicate that no export air shipments were made of these commodities. Instead, table 38 shows that no country grouping received as much as 100,000 pounds by air of either of these commodities in 1967-70.

Fresh oranges. Air shipments of fresh oranges were found only in 1968 and 1969. In 1968, Bermuda/Jamaica received all of the air shipments

27/ Without groupings, the size of each flow matrix would have been 44 x 165 or 7,260 cells.

Table 35.--Commodities selected for study

Schedule B number 1/	Commodity
05110 10	Oranges, fresh
05110 20	Tangerines, fresh
05120 10	Lemons, fresh
05120 20	Limes, fresh
05120 30	Grapefruit, fresh
05120 40	Other citrus, fresh, n.e.c.
05140 00	Apples, fresh
05150 00	Grapes, fresh
05193 10	Peaches and nectarines, fresh
05193 20	Prune and plums, fresh
05193 30	Cherries, fresh
05193 40	Other stone fruit, except tropical,n.e.c.
05194 10	Strawberries, fresh
05194 20	Other fresh berries
05195 00	Tropical fruit, except bananas and dates, fresh
05198 10	Watermelon, fresh
05198 20	Other melons, fresh, n.e.c.
05198 30	Pears, fresh
05440 00	Tomatoes, fresh
05450 30	Peppers, fresh
05450 40	Cabbage, fresh
05450 60	Celery, fresh
05450 65	Cucumbers, fresh
05450 70	Lettuce, fresh

1/ As found in Schedule B, Statistical Classification of Domestic and Foreign Commodities Exported from the United States, U.S. Dept. Commerce.

shown, with Puerto Rico shipping 79,000 of 115,000 pounds received. In 1969, Bermuda/Jamaica received nearly 317,000 of 460,000 pounds air shipped, but the South Atlantic district had become the principal shipping point.

Fresh grapes. In 1967 and 1968, Puerto Rico was the chief shipping point for fresh grapes moving by air and Bermuda/Jamaica was the sole recipient. In these 2 years, Puerto Rico accounted for 88 and 81 percent of all shipments to Bermuda/Jamaica.

In 1969, Hong Kong became the chief recipient, accounting for 1.04 of 1.52 million pounds. The North Pacific district was the chief shipping point for these flights, accounting for 945,000 pounds in 1969 and all shipments in 1970 when Hong Kong was shown as the sole receiver of air-shipped grapes. Marked changes in volume accompanied the changes in shipping pattern. Total volume ranged from 1,521,000 (1969) to 305,000 (1970) pounds.

Table 36.--Customs district groupings 1/

Group name	Districts included
North Atlantic	Portland, Me.; St. Albans, Vt.; Boston, Mass.; Providence, R.I.; Bridgeport, Conn.; New York, N.Y.; Philadelphia, Pa.; Baltimore, Md.
Great Lakes	Ogdensburg, N.Y.; Buffalo, N.Y.; Pembina, N.Dak.; Minneapolis, Minn.; Duluth, Minn.; Milwaukee, Wis.; Detroit, Mich.; Chicago, Ill.; Cleveland, Ohio; St. Louis, Mo.
South Atlantic	Norfolk, Va.; Wilmington, N.C.; Charleston, S.C.; Savannah, Ga.; Miami, Fla.
Gulf	Tampa, Fla.; Mobile, Ala.; New Orleans, La.; Port Arthur, Tex.; Galveston, Tex.; Laredo, Tex.; El Paso, Tex.; Houston, Tex.; Nogales, Ariz.
South Pacific	San Diego, Calif.; Los Angeles, Calif.
North Pacific	San Francisco, Calif.; Portland, Oreg.; Seattle, Wash.; Great Falls, Mont.
Alaska	Juneau, Alaska.
Honolulu	Honolulu, Hawaii.
Puerto Rico	San Juan, P.R.
Virgin Islands	Virgin Islands of the United States.

1/ Each of the customs districts shown contains more than one port. For a complete listing see Code Classification of United States Customs Districts and Ports Used in Compiling the United States Foreign Trade Statistics, U.S. Department of Commerce, Washington, D.C., January 1, 1967.

Table 37.--Country groupings 1/

Group name	Countries included
Greenland	Greenland, Miquelon, and St. Pierre Islands.
Canada	Canada.
Mexico	Mexico.
Central America	Guatemala, British Honduras, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Canal Zone.
Bermuda/Jamaica	Bermuda, Bahamas, Cuba, Jamaica, Haiti, Dominican Republic, Leeward and Windward Islands, Barbados, Trinidad and Tobago, Netherlands, Antilles, French West Indies.
Venezuela	Venezuela.
Northern South America	Colombia, Guyana, Surinam, French Guiana.
Western South America	Ecuador, Peru, Bolivia, Chile.
Eastern South America	Paraguay, Uruguay, Falkland Islands.
Brazil	Brazil.
Argentina	Argentina.
Scandinavia	Iceland, Sweden, Norway, Finland, Denmark.
British Isles	United Kingdom of Great Britain and Northern Ireland, Ireland (Eire).
France & Lowlands	Netherlands, Belgium and Luxembourg, France.
East Germany	Soviet Zone of Germany and Soviet Sector of Berlin.
West Germany	Federal Republic of Germany, Western Sectors of Berlin and the Saar.
Austria-Hungary	Austria, Czechoslovakia, Hungary, Switzerland.

See footnote at end of table.

Continued

Table 37.--Country groupings 1/--Continued

Group name	Countries included
Northeastern Europe	Estonia, Latvia, Lithuania, Poland and Danzig, Union of Soviet Socialist Republics.
Southwestern Europe	Azores, Spain, Portugal, Gibraltar, Malta and Gozo, Italy.
Southeastern Europe	Yugoslavia, Albania, Greece, Rumania, Bulgaria, Turkey, Cyprus.
Western Asia	Syrian Arab Republic, Lebanon, Iraq, Iran, Israel, Jordan, Gaza Strip, Kuwait, Saudi Arabia, Arabia Peninsular States, Aden, Bahrain.
Southern Asia	Afghanistan, India, Pakistan, Nepal, Ceylon, Burma, Thailand, North Vietnam, South Vietnam, Laos, Cambodia, Malaysia, Singapore, Indonesia, Philippines, Macao, Southern and Southeastern Asia n.e.c.
Eastern Asia	China, Outer Mongolia, North Korea, Republic of Korea.
Hong Kong	Hong Kong (British Crown Colony).
Taiwan	Taiwan.
Japan	Japan.
Nansei/Nanpo	Nansei and Nanpo Islands, n.e.c.
SOPAC Islands	New Guinea, British Western Pacific Islands, French Pacific Islands, Trust Territory of the Pacific Islands.
New Zealand	New Zealand.
Australia	Australia.
Northern Africa	Morocco, Algeria, Tunisia, Libya, Egypt, Sudan.

See footnote at end of table.

Continued

Table 37.--Country groupings 1/--Continued

Group name	Countries included
Western Africa	Canary Islands, Spanish Africa n.e.c., Mauritania, Federal Republic of Cameroon, Senegal, Guinea, Sierra Leone, Ivory Coast, Ghana, Gambia, Togo, Nigeria, Central African Republic, Gabon, Western Africa n.e.c., British West Africa, Madeira Islands, Angola, Western Portuguese Africa, Liberia, Congo, Burundi and Rwanda.
Eastern Africa	Somali Republic, Ethiopia, French Somaliland, Uganda, Kenya, Seychelles and Dependencies, Tanzania, Mauritius and Dependencies, Mozambique, Malagasy Republic.
Republic of South Africa	Republic of South Africa.
Southern Africa	Zambia, Rhodesia, Malawi, Southern Africa n.e.c.
Puerto Rico	Puerto Rico.
Virgin Islands	Virgin Islands of the United States.
Trust Territories	Midway Island, Wake Island, Guam, Canton and Enderbury Islands.
American Samoa	American Samoa.

1/ For a more complete delineation of the areas see Classification of Country Designations Used in Compiling the United States Foreign Trade Statistics, U.S. Dept. Commerce, January 1967.

Fresh apples. Shipments of fresh apples by air increased from 396,000 (1967) to 502,000 (1969) pounds. No shipments are shown for 1970. In all 3 years Bermuda/Jamaica was the sole destination. In the same years, Puerto Rico was the chief shipping point, accounting for 248,000 (1967), 251,000 (1968), and 236,000 (1969) pounds. The South Atlantic district, however, in 1970 accounted for shipments to Bermuda/Jamaica totaling 239,000 pounds.

Fresh lettuce. Between 1967 and 1968 air freight shipments of fresh lettuce increased from 760,000 to 3,579,000 pounds. For 1969 a minor decline of 9,000 pounds is shown. In these 2 years, more than one-half of the fresh

Table 38.--Exports by air of selected commodities from major U.S. origin areas, quantity and percent of total volume shipped 1/

Commodity	1967		1968		1969		1970	
	Quantity	Percent of total shipped	Quantity	Percent of total shipped	Quantity	Percent of total shipped	Quantity	Percent of total shipped
	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent
Fresh oranges	--	--	115	2.1	420	6.8	--	--
Fresh lemons	--	--	--	--	--	--	--	--
Fresh grapefruit	--	--	--	--	--	--	--	--
Fresh grapes	634	19.8	460	20.5	1,521	8.9	305	21.0
Fresh apples	396	6.7	352	7.2	502	8.2	--	--
Fresh lettuce	760	17.0	3,579	52.6	3,570	53.7	243	26.2
Fresh straw-berries	2,553	98.2	2,872	99.4	2,270	100.0	747	100.0
Total	4,343	26.8	7,378	33.1	8,283	31.6	1,295	45.4

1/ Data obtained from U.S. Dept. Commerce, Bureau of the Census.

lettuce exported is shown to have been shipped by air. In 1970, however, airlifted exports of lettuce had declined to 243,000 pounds.

Distribution patterns for lettuce have also been unstable. Bermuda/Jamaica was the principal destination in 1967, accounting for 488,000 pounds, of which 392,000 were shipped from the South Atlantic district. In the same year Scandinavia received 148,000 pounds by air and Hong Kong received 122,000. The North Atlantic and North Pacific districts, respectively, were the chief suppliers.

In 1968, Bermuda/Jamaica increased its takings to 563,000 pounds and Scandinavia increased to nearly 2.6 million pounds, while Hong Kong remained nearly stable. The South Atlantic, North Atlantic, and North Pacific districts continued in their respective roles.

Scandinavia continued as the largest receiver in 1969, accounting for 1.9 million pounds with the North Atlantic district remaining the sole shipping point. Bermuda/Jamaica followed closely with 1.2 million pounds of which 550,000 came from the South Atlantic district and 223,000 from Puerto Rico. Hong Kong increased its takings slightly to 166,000 pounds from the North Pacific district.

In 1970, Scandinavia was the chief destination of airshipped lettuce, accounting for 243,000 pounds. The North Atlantic district was Scandinavia's chief source, accounting for nearly 240,000 pounds.

Fresh strawberries. Airlifted exports of fresh strawberries varied from nearly 2.9 million (1968) to 0.7 million (1970) pounds. In 1967 and 1968, West Germany was the principal destination, accounting for 44 and 32 percent respectively, closely followed by Scandinavia with 35 and 32 percent. In both years the North Atlantic district was the leading point of export.

In 1969, Scandinavia and West Germany reversed their positions, accounting for 34 and 28 percent of all air-carried export strawberries. The North Atlantic district continued as Scandinavia's leading supplier, but the South Pacific district accounted for more than one-half of the 645,000 pounds flown to West Germany.

By 1970 West Germany had regained its role as the largest export market for airshipped U.S. strawberries, accounting for 35 percent of the total. Scandinavia followed closely with 32 percent. The North Atlantic district supplied 99 percent of Scandinavia's takings and 43 percent of West Germany's takings. The South Pacific district, however, was West Germany's principal source, accounting for 51 percent of total receipts from the United States.

Summary. While the sheer volume of data in a distribution pattern raises a barrier to comprehension, certain identifiable threads can be discerned in the distribution patterns for air-carried commodities.

The following discussion attempts to identify and discuss these threads. The order of discussion is not intended to reflect the relative importance.

Although the North Atlantic district is not a leading producer of fruits or vegetables, it is a significant (in many instances the leading) district of embarcation for air shipments of these commodities. For commodities produced on the West Coast or in the Western States, the benefits of direct shipments from origin to destination are lost. Even if no change of mode or equipment is made at North Atlantic airports, the entry of California or Arizona fruits and vegetables into export channels at North Atlantic ports would seem to be an unnecessary complication.

Another discernible thread is the frequent role of Bermuda/Jamaica as a major destination. The relatively high value of agricultural commodities shipped by air is difficult to reconcile with the relatively low per capita incomes associated with the nations bordering on the Caribbean Sea. Based on a survey of 231 U.S. shippers and receivers of perishable commodities conducted by USDA in 1969-70, many respondents indicated that a large share of the foodstuffs shipped by air was destined for use by hotels or restaurants. At the same time, the Caribbean area is a favorite destination for U.S. tourists. It seems reasonable to conclude, therefore, that the air traffic to Bermuda/Jamaica is largely the result of tourism.

The marked decline in the quantity shipped by air in 1970 also deserves comment. At least a part of the decline is attributable to a change in reporting procedure. During 1967-69, all shipments of a commodity valued at more than \$100 were reported. Commencing in October 1969, only shipments valued at more than \$250 were reported. 28/ The decline in volume in 1970 would seem to indicate that many air shipments are valued at or below \$250.

The decline in volume was most pronounced for fresh fruits and vegetables, which would seem to indicate that the usual air shipment of these commodities is quite small.

Finally, the general lack of central tendencies in the export data deserves attention. The air freight industry is young and might not yet have found any well-worn paths.

The speed of transit offered by air freight is its primary strength. By using air freight, a merchandiser can adjust to short-term market conditions. Other modes are used for the usual market. It is possible, therefore, that air freight will never show the well-defined central tendencies characteristic of the older, less flexible modes.

28/ Guide to Foreign Trade Statistics: 1970, U.S. Dept. Commerce.

Market Share 29/

In 1967-70, the total quantity of fresh fruits and vegetables (considered herein) shipped by air varied from 1.3 million pounds (1970) to 8.2 million pounds (1969) (table 38). In the same years, the average market share per product for air freight varied from 22 percent (1969) to 45 percent (1970). No overall trend is discernible. It seems likely that the large year-to-yea changes shown reflect the infant nature of the air freight industry. With few exceptions the quantities shown are small. The total picture is consistent with a pattern in which shippers try air freight on an experimental basis and are not satisfied with the results.

Air is the dominant export carrier of fresh strawberries. I. each of the 4 years shown in table 38, at least 98 percent of fresh strawberry exports moved by air. For fresh lettuce the volume shipped by air increased from 760,000 pounds in 1967 to 3.6 million pounds in 1968 and 1969. In the sam period, air's average market share rose from 17 percent (1967) to 54 percent (1969). The decrease in volumes shown for 1970 is at least partially the result of the change in reporting methods previously mentioned.

Outlook for Air

The outlook for air freight as a means of export or import cannot be assessed solely in relation to the costs and services offered by competing modes. The growth of air freight is and will be limited by the extent to which the various services and functions necessary for international trade become available to shippers by air.

Any marketing chain is a complex system of interdependent links. The buyer must be satistified as to the quantity, quality, and price of the good in question. Handling, packaging, and transportation must be obtained in satisfactory quantity, quality and cost. Finally, certain intangible service such as financing, quality assurance, management, and promotion must be available. A marketing system can seldom function more effectively than its least efficient subsystem.

There is a further tendency to view import and export transactions as a simple variation of a simply conceived market, that is, the market consist of a buyer, a seller, and a transporter who carries the goods from buyer to seller. This view is that the difference between an import or export transaction and a domestic transaction is caused by the difference in the geographic distance between buyer and seller.

A shipment of frozen lamb meat which arrived in New Orleans serves to illustrate that the above conceptualization is greatly oversimplified. 30/

29/ Market share: The quantity handled by a mode relative to the total flow handled by all modes.

30/ "New Orleans Port Record," Board of Commissioners of the Port of New Orleans, P.O. Box 60046, New Orleans, La., June 1971, pp. 16-17.

First, it was necessary to obtain assurances that official meat inspectors would be available when the shipment arrived. Since a refrigerated motor vessel was used and docking time could not be accurately predicted, inspectors would be needed on short notice. A large cold-storage warehouse close to the debarcation point was made ready. Stevedores, materials handling equipment, a clear path from the dock to the warehouse, and warehousemen were arranged for. In addition, port officials, the ship's agent, and the customs broker all were alerted to meet the shipment and coordinate their actions. The salient features of this narrative are: (1) The administrative procedures pursuant to the shipment were conducted expeditiously, (2) a controlled environment was provided for the goods for nearly all of the importing process, (3) the time during which the environment of the goods was not controlled was kept to an absolute minimum (rapid handling can substitute for controlled environment within narrow limits), (4) the entire process required complex, coordinated, interrelated actions from many participants.

While the shipment in the example was made by vessel, the same system characteristics must be present regardless of the mode employed.

Within the framework just outlined it is possible to discuss some of the characteristics of international air freight traffic with a view to future development.

The route structure of airlines has an impact on the future of air cargo. Currently, scheduled international flights from the United States tend to originate at major coastal cities and terminate in foreign captials. This structure seems to have been engendered by the normal flow of people and is doubtless well suited to passenger traffic. To the extent that capital cities are population centers, they are suitable for marketing foodstuffs. The origins, however, are generally inappropriate for foodstuffs. Relatively little meat, fruits and vegetables, or livestock are produced near the Northeastern U. S. coastal regions. Thus, agricultural commodities intended for export usually must move through lengthy domestic transportation channels. In most instances the route structure and scheduling found domestically are not intended to mesh and do not mesh well with international routes and schedules. As a result, exports and imports frequently must change equipment, firms, and modes at the seacoast. These changes tend to reduce the speed and other benefits available from international flights. At this time the existing structure of routes and schedules appears to be a major barrier to any marked increase in the quantity of airlifted agricultural commodities.

Interrelated with the route and scheduling problem are the aircraft themselves. Although the speed of aircraft seems to remove or reduce the need to refrigerate perishables in flight, the existing routes and schedules tend to result in air cargo remaining in air terminals for significant periods. A typical terminal is surfaced with blacktop and open to the sun. A typical aircraft is constructed of metals with high coefficients of thermal conductivity. A pallet awaiting shipment at an airport or even loaded on a plane at an airport receives more than 40 percent of the radiant heat available

from the sun and another significant quantity of heat from the sun-warmed pavement. For these reasons, more than ordinary care is needed to maintain the quality of heat-sensitive commodities shipped by air.

The view that an inflight solution is to take advantage of the low temperatures prevailing in the upper atmosphere where modern aircraft operate is not totally correct. The drawback is that the low-density upper atmosphere is a relatively poor coolant. While inflight refrigeration may enhance the quality of perishable air cargo at destination, the technology involved is not simple.

In summary, the inflight speed of aircraft is not a close substitute for the usual preservation techniques required by perishables. Indeed, airshipped perishables may require more than usual attention to insure final product quality. From this it may be concluded that increased shipments of perishables must be attended by some combination of field cooling and refrigeration at terminals and inflight.

Although large changes in the volume of air freight are, in large measure, dependent upon changes in the total marketing system, small changes in volume could be brought about by actions of the air carriers themselves. A reduction in rates, for example, could be expected to result in increases in cargo. The probability that such rate reductions will take place is difficult to determine without knowledge of actual operating costs.

Where unutilized capacity exists, however, it seems reasonable to believe that rates could decline to the variable cost of utilization. Thus, the presence of unutilized capacity on a route would indicate a potential for increased traffic.

To evaluate this area, data reflecting directional traffic flows were obtained from the International Air Transport Association. In 1967, eastbound traffic exceeded westbound traffic over the North Atlantic route by 17,200 metric tons (table 39). By 1969 the imbalance had reversed and westbound traffic exceeded eastbound by 11,600 metric tons. Conceptually this imbalance represents a potential for nearly 12,000 metric tons of additional air cargo moving from the U.S. to Europe. If, however, this empty space were evenly distributed over the 46,777 eastbound flights made in 1969, less than one-quarter metric ton of unused capacity would have been available on any single flight. 31/

The imbalance for mid-Atlantic traffic is in the same direction (westbound), but much smaller in magnitude. Assuming that this imbalance was uniformly distributed, about 2 metric tons per flight would be available. 32/ While this potential for additional traffic is substantial in total, it must be apportioned over the area between Miami and Rio de Janeiro, Brazil. The probability that U.S. exports could utilize the empty cargo space is relatively small.

31/ World Air Transport Statistics, International Air Transport Association, P.O. Box 315, 1215 Geneva 15 Airport, Switzerland.
32/ Loc. cit.

Table 39.--Volume of cargo and mail shipped by air across North Atlantic, 1967-69 1/

Item	1967			1968			1969		
	East-bound	West-bound	Net difference and direction	East-bound	West-bound	Net difference and direction	East-bound	West-bound	Net difference and direction
	Metric tons								
Cargo	121,661	110,415	EB 11,246	142,984	166,179	WB 23,195	204,494	224,506	WB 20,012
Mail	20,821	14,810	EB 8,011	24,131	17,072	EB 7,059	27,705	19,315	EB 11,390
Total	142,482	125,225	EB 17,257	167,115	183,251	WB 16,136	232,199	243,199	WB 11,622
	Mid-Atlantic traffic of IATA members, 1968-69 1/, 2/								
Cargo	---	---	---	1,084	4,299	WB 3,215	1,413	5,036	WB 3,623
Mail	---	---	---	673	789	WB 125	641	933	WB 292
Total	---	---	---	1,757	5,097	WB 3,340	2,054	5,969	WB 3,915

1/ Source: World Air Transport Statistics, International Air Transport Association, P.O. Box 315, 1215 Geneva 15 Airport, Switzerland.

2/ Mid-Atlantic defined as traffic between Europe and the Western Hemisphere via gateways south from Miami, Florida to Rio de Janeiro, Brazil.

APPENDIX

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U.S. Department of Agriculture
Economic Research Service
Marketing Economics Division
Washington, D.C.

POTENTIALS FOR IMPROVEMENT IN TRANSPORTATION OF FRESH FRUITS AND VEGETABLES IN EXPORT CHANNELS

INTERVIEW OUTLINE

Firm: Name ________________

Address ________________

Respondent: Name ________________

Title ________________

Telephone Number __________

I. Does the firm:
   a) Arrange for the entire export movement? (Comment as to the extent of their control over the marketing chain).
   b) Arrange for movement only to the port of embarcation?

II. What is the usual transit time (origin to port) for shipments made by?
   a) Rail
   b) Truck
   c) Piggyback

III. Is suitable equipment usually available?
   a) Mechanical refrigerator cars
   b) Piggyback containers
   c) Trucks

IV. What advance notice is needed to obtain equipment?

V. Do you encounter problems in scheduling shipments to make sailing dates? (Comment as to differences among rail, piggyback and truck.)

(1) Mechanical refrigerator cars
(2) Piggyback
b) Truck

VII. About what percent of your export shipments used?
a) Rail (Mechanical car)
b) Piggyback
c) Truck
for the domestic part of the trip?

VIII. What causes you to select one mode over another for a particular shipment?

IX. What is the usual channel used for export sales?
a) Routes used
b) Ports used
c) Kinds of firms involved (Probe as to the reasons for selecting the routes and ports mentioned).

X. What is the usual rate charged by?
a) A container ship
b) A conventional break bulk ship (Probe as to how much variation is experienced in these rates). (Determine if the rates are for U.S. or Foreign-Flag ships).

XI. Do these rates include stevedoring, port and insurance charges? If not, what are the typical charges you must pay?

XII. How difficult is it to obtain a ship at the time and place desired?

XIII. Have you found Inspection and Customs services to be available when and where desired? (Probe to see if there are differences among U.S. ports or between U.S. and foreign ports).

XIV. What barriers exist to increasing the level of exports to Western Europe?
a) Transportation costs
(1) Domestic
(2) Ocean

b) Transportation services
(1) Domestic
(2) Ocean

c) Tariff barriers

d) Non-tariff barriers

XV. What are the solutions to these problems?